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The American Numismatic Society Museum Notes

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THE AMERICAN NUMISMATIC SOCIETY

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SOME SELEUCID TEST PIECES

(Plate 1)   Arthur Houghton

Test pieces, employed by mints to determine the viability of coin dies and designs, remain among the least studied of numismatic artifacts.[1] In 1964, based on a compilation provided by Herbert Cahn, M. Comstock and C. Vermeule published a list of the seventeen known Greek and Roman (fourth century B.C. to imperial) test pieces.[2] Since then, the Brussels collection has acquired a lead object that may have been used to test a rejected coin design (below) and a set of seven fifth- and fourth-century B.C. western Greek test pieces were offered for sale in Basel in 1988.[3] Four more, all of the Seleucid period, have since appeared. Given the relative scarcity of such material, it seems useful to describe and briefly discuss the five known Seleucid objects of this category.[4]

[1] For information and assistance essential to the completion of this article, I wish to thank Dr. François de Callatay, Brussels: Brian Kritt, Burtonsville; Prof. Georges Le Rider, Paris; Catharine C. Lorber, Woodland Hills; and Dr. Jeffrey Spier, London. Dr. Spier and Jack Guevrekian are to be thanked for bringing to the author's attention three of the examples cited here. Wayne Moore provided the photographs for 1, 3, 4, and 5. In this article *WSM* refers to E.T. Newell, *The Coinage of the Western Seleucid Mints from Seleucus I to Antiochus III*, ANSNS 4 (1941, rpt. 1977). AHNS refers to the author's collection, Washington, D.C.

[2] M. Comstock and C. Vermeule, *Greek Coins 1950-1963* (Boston 1964), p. 75.

[3] Auctiones 17, 7 June 1988, 325-31.

[4] The author has previously discussed a number of lead issues, almost certainly coins, of the late second and early first century B.C. "Two Late Seleucid Lead

Antiochus II (261-246 B.C.)

1. Lead, 28 x 30 mm, 25.79 g, single sided (reverse only).
   Lysimachia, ca. 250 B.C.
   Rev.: ΒΑΣΙΛΕΩΣ to r.; ΑΝΤΙΟΧΟΥ to l. Nude Apollo seated l. on
   omphalos, holding arrow in extended r. hand and resting l.
   on bow; in outer l. field, lion's head r.; between Apollo's legs,
   ✦; in exergue, ♦; dotted border.
   Location: AHNS 66

The lion's head appears as a symbol on coins of Lysimachia in Thrace struck under Lysimachus and later under Antiochus II (261-246 B.C.) and Antiochus Hierax (ca. 239-228 B.C.) and clearly identifies the object with that city. The controls differ from those on known coins of either Seleucid ruler, but the placement of the lion's head—pushed between the letters of the king's name—conforms exactly to the convention used on Lysimachia's earliest tetradrachm of Antiochus II of the Apollo with arrow type, *WSM* 1610, as well as that of the mint's earliest issue of Antiochus which has on its reverse Apollo with a *bow*.[5] This test piece, which may reflect a reverse die that was never used on the mint's regular coinage, can therefore be placed towards the beginning of Lysimachia's coinage under Antiochus II. Newell dated the series *WSM* 1610-1613 to ca. 250 B.C., but Le Rider has shown that these coins, which all bear a posthumous, elderly portrait of Antiochus I, represent early issues of this mint, and were succeeded by later issues with the intended (although somewhat indeterminate) representation of Antiochus II on which the lion's head symbol does not appear.[6] The test piece must thus belong to an earlier moment in Lysimachia's mint history under Antiochus II, therefore ca. 260-255 B.C.

Issues from the Levant," *INJ* 11, pp. 26-31. A second example of the issue of Demetrius III, *INJ* 11, p. 30, has appeared (AHNS 484), and this object can now be identified as a true coin, intended for circulation, rather than a test piece.

[5] Peus 340, 2 Nov. 1994, 480, struck from the same obverse die as *WSM* 1610-11.

[6] G. Le Rider, "L'atelier séleucide de Lysimachie (*WSM* 1610-21)," *NumAntClas* (1988), pp. 195-205.

Antiochus III (223-187 B.C.)

2. Lead, 27 x 25 mm, 12.25 g, double sided.
   Antioch (?), ca. 223-220 B.C.
   Obv.: Diademed head of Antiochus r.; fillet border.
   Rev.: ΒΑΣΙΛΕΩΣ to r.; ΑΝΤΙΟΧΟΥ to l. Bee, upwards; dotted
   border.
   Location: Brussels, Bibliothèque Nationale Albert 1er
   Ref.: P. Naster, *Catalogue de la collection Lucien de Hirsch* (Brus-
   sels, 1959), 1665.

The obverse of this object is close to, but does not match, the early
dies of Antiochus III employed by the mint of Antioch and appears to
have been the work of one of that city's early die engravers (see esp.
WSM, pl. 26, 11-12). It seems likely, if not certain, therefore, that it
was produced at the Seleucid capital. The reverse type, a bee, falls
entirely outside the mainstream of standard Seleucid iconography[7]
and, if it were not for the relationship of the obverse to an Antiochene
engraver, one might consider it to be a civic badge of a city such as
Ephesus, which used a bee as coin type from the fourth through the
second century B.C. The evidence is not clear that the Brussels object
was intended to test a coin design. An alternative possibility is that it
was a double-sided royal seal.

3. Lead, 25 x 28 mm, 17.49 g, double sided.
   Antioch, ca. 200 B.C.
   Obv.: Diademed head of Antiochus r.; fillet border.
   Rev.: ΒΑΣΙΛΕΩΣ to r.; ΑΝΤΙΟΧΟΥ to l. Nude Apollo seated on
   omphalos, holding arrow in extended r. hand and resting l.
   on bow; in outer l. field, ⏃ (the monogram is not clear);
   traces of control in exergue?
   Location: AHNS 82.

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[7] The author knows of only three minor Seleucid issues with bees as type. All are
bronzes: *CSE* 1057, with obv. bee, rev. standing Apollo, attributed to Antiochus III
at Susa; Le Rider, *Suse Sous les Séleucides et les Parthes*, Paris 1965, p. 66, 61, with
obv. bee, rev, stag, given to Antiochus IV, also at Susa; and *CSE* 1275, attributed
to Ecbatana under Alexander I Balas, with obv. portrait of Alexander, rev. bee.

The object is worn (from use?) and, with the exception of its metal, resembles a real coin in every respect. Two-sided, it was struck from tetradrachm dies, the obverse apparently the same as that used for two issues, *WSM* 1102β-δ (with the same control, **A**, to l., **H** in exergue), and *WSM* 1105α. To the author's knowledge the reverse is not recorded, but almost certainly reflects a die intended for use, or in actual use, at the time.

Newell has dated *WSM* 1102-5 to the period 208-200 B.C., but G. Le Rider has narrowed the probably date of Newell's Antioch Series IV (within which *WSM* 1102-5 fall) to ca. 200 B.C. or a bit earlier, connecting the production of this series with the buildup to the Battle of Panion the same year.[8]

Antiochus VI, 144-142/1 B.C. (at Antioch, 143-142/1 B.C.)

4.　Lead, 30 x 30 mm, 25.65 g, single sided.
　　Antioch, 143/2 B.C.
　　Obv.: Diademed, radiate head of Antiochus VI r.; fillet border.
　　Location: AHNS 743.

The object can be identified and dated exactly. It was struck from a known tetradrachm die of Antiochus VI that was used at Antioch only in connection with reverses of year S.E. 170 (143/2 B.C), an example of which is shown here (Plate 1, 4A).[9] The features of the portrait are not crisp on either the known coins or the test piece, and the die appears to have been worn when they were struck; the purpose of the object itself is therefore not clear.

Antiochus VI, a putative son of Alexander I Balas, himself a pretender to the Seleucid throne, was put forward as king by Diodotus Tryphon, military commander at Apamea under Demetrius II (at Antioch, 145-144 B.C.), probably in the summer of 144.[10] About the

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[8] G. Le Rider, study of the Seleucid mint of antioch (the early coinages, through Antiochus V), with A. Houghton, publication forthcoming.

[9] The known examples include: *ACNAC* 6 (Arthur Dewing Collection), Peus 282, 30 Oct. 1973, 173, and NFA 8, 6 Dec. 1979, 283 (illustrated here).

[10] A. Houghton, "The Revolt of Tryphon and the Accession of Antiochus VI at Apamea," *SNR* 71, 1992, pp. 119-141.

beginning of 143 B.C., their court moved to Antioch, where coining continued using many of the same die engravers and mint officials who worked at Apamea. This test piece, and the coins that were struck from the same die, were probably produced the same year.

Antiochus VIII, Childhood Reign, 128 B.C.

5. Lead, 37 x 32 mm, 47.52 g, single sided (obverse only).
    Antioch, 128 B.C.
    Obv.: Diademed head of Antiochus r.; fillet border.
    Location: AHNS 673.

This test piece bears the childish portrait of Antiochus VIII, as he is shown on a small set of tetradrachms issued by the mint of Antioch, probably in 128 B.C. When they first appeared, these coins and associated drachms were considered to be an issue of Tripolis because of their reverse type—a standing Tyche, wearing a polos and holding a tiller and cornucopia.[11] However, they have now been shown to have been struck at the Seleucid capital, probably under the authority of Antiochus' mother, Cleopatra Thea who, threatened by Alexander Zabinas—a rival, pretender claimant to the Seleucid throne—may have proclaimed her son king in a futile attempt to consolidate her own rule over Seleucid Syria.[12] The impression is sharp beneath the surface oxidation. The lead piece may have been a final proof of the single die that was used to strike all known tetradrachms of the issue.

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[11] *CSE* 689-91

[12] A. Houghton and G. Le Rider, "Un premier règne d'Antiochos VIII Épiphane à Antioch en 128," *BCH* 112 (1988), pp. 401-11.

AN UNPUBLISHED SILVER DRACHM
ATTRIBUTED TO ARTAXIAS III (A.D. 18–34)
OF ARMENIA

L. A. SARYAN

Silver and bronze coins of the kings of ancient Armenia are among the most important Armenian artifacts to have survived to our day. These, as well as the coins of Rome which pertain to Armenia, can help to illuminate and sometimes reconstruct the early history of Armenian dynasties.[1] A few thousand such coins, discovered as single pieces and as hoards in several Mediterranean and Near Eastern countries, are known in museums and private collections. These coins are actively collected and studied, and new discoveries, such as the coin described below, are occasionally reported.

Most ancient Armenian coins were struck by the kings of the Artaxiad dynasty, founded by Artaxias I (Artashes I in Armenian) in 189 B.C. In its nearly two-century existence, this dynasty was destined to achieve unparalleled glory. Under Tigranes II the Great (95–56 B.C.),

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[1] The ancient coinage of Armenia has been discussed in three books by P. Z. Bedoukian: *Coinage of the Artaxiads of Armenia* (London: Royal Numismatic Society, 1978) (hereafter, *CAA*); *Coinage of the Armenian Kingdoms of Sophene and Commagene* (Los Angeles: Armenian Numismatic Society, 1985); and *Roman Coins and Medallions Relating to Armenia* (Vienna: Mekhitarian Press, 1971) (in Armenian, hereafter, *RCM*).

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Armenia briefly became a world power. At the time of the invasion of Lucullus in 69 B.C., Tigranes controlled territory stretching from the Caucasus mountains and the Caspian Sea to the Mediterranean shores of present day Lebanon and Israel.

The numismatic record of this period continues to be enriched with newly discovered varieties and types. As recently as 1959, a previously unknown tetradrachm of Artavasdes II (56–34 B.C.) was discovered in an archaeological excavation near the village of Parakar not far from Yerevan.[2] The authenticity of this important coin was questioned for several years until two new examples of this coin, from different dies, were found.[3]

Contemporary late Hellenistic rulers of Syria, Egypt, Pontus, and Cappadocia, Armenia's western neighbors, are generally portrayed on their coins wearing a simple diadem. In contrast, the kings of Armenia and Parthia are noted for their distinctive headgear. Silver and bronze Artaxiad coins depict the king, on the obverse, wearing an elaborate and attractive crown known as the Armenian tiara. The tiara usually has five peaks, a cylindrical body, a diadem with ribbons or tassels hanging from the back, edges decorated with pearls or precious stones, and a prominent, centrally placed star.[4]

The best known depiction of the Armenian tiara is seen on the tetradrachms of Tigranes the Great. These coins usually have a central star with eight rays[5] flanked on each side by an eagle whose body is facing outward with his had turned toward the star. An ear flap (lappet), which often covers the ear, and a neck covering (fanion) are promi-

[2] Kh. A. Mousheghian, "The Tetradrachm of Artavasdes II," *Patma-Banasirakan Handes* 1964, 2–25, pp. 317–23 (in Armenian). For an abstract of this paper, see Y. T. Nercessian, *Armenian Numismatic Bibliography and Literature* (Los Angeles: Armenian Numismatic Society, 1984) (hereafter, *ANBL*), pp. 294–95.

[3] For illustrations of the three known tetradrachms of Artavasdes II, see Y. T. Nercessian, *Armenian Coins and Their Values* (Los Angeles: Armenian Numismatic Society, 1995) (hereafter, *ACTV*), pls. 10 and 45.

[4] Y. T. Nercessian, "The Evolution of the Armenian Tiara," *Armenian Numismatic Journal* 11, 1 (March 1985), pp. 2–12.

[5] An exception is a scarce tetradrachm of Tigranes II on which the star has six points rather than eight: L. A. Saryan, "Three Unreported Tetradrachms of Tigranes the Great," *Armenian Numismatic Journal* 18, 2 (June 1992), pp. 37–38.

nent. On the tetradrachms of his successor Artavasdes II, the ear
lappet is tucked under the diadem, leaving the ear and an earring
visible. The central eight-rayed star is retained, but the eagles are
replaced by wavy lines. Not all of these details are seen on the coins
of later Artaxiad rulers, but the star remains as a prominent feature.[6]
Armenian tiaras, with some variations, are seen on some contemporary
Roman coins which refer to events in Armenia[7] and on some coins of
Commagene when the king was of Armenian lineage.[8] The Armenian
tiara is so unique that whenever it is observed, it can be safely
surmised that the coin is related in some fashion to ancient Armenia.

Recently, an unreported and apparently unique silver coin of a King
Artaxerxes wearing an Armenian tiara appeared in a private collec-
tion. The coin is silver, 3.590 g, 22 mm, with a reverse die module of
19.5 mm, and die alignment of 12:00.

ca. 2x

[6] See, for example, Credit Suisse 4, 3 Dec. 1985, 667 and 668. Coin 667 is a 5.33 g
bronze of Tigranes III (20–8 B.C.) showing a tall tiara with sloped sides, some pearls
or gems along at least one edge, and a centrally placed star with ten rays, but no
eagles or floral ornamentation (also see P. Z. Bedoukian, "An Unpublished Coin of
Tigranes III [20–8 B.C.] *Armenian Numismatic Journal* 13, 2 [June 1987],
pp. 12–13). Coin 668 is a 4.83 g bronze of Tigranes IV (8–5 B.C.) showing the
heavily bearded king wearing a more cylindrical tiara with an ear lappet. The tiara
decoration shows pearls or precious gems at the borders with a distinct centrally
placed eight-pointed star, but without eagles or floral pattern.

[7] See Bedoukian, *RCM*, coins 5, 6, 11–18.

[8] See Nercessian, *ACTV*, coins 229–31, 236, 244.

The obverse has a portrait of Artaxerxes facing right, enclosed in a wreath and wearing an Armenian tiara with sloped sides. The tiara has five peaks and two parallel rows of pearls or precious stones along the top and sides. An eight-pointed star flanked on each side by a wavy floral pattern is prominently placed. Neither a lappet nor a fanion are clearly visible. Three tassels fall in a wave behind the king's head. The king is clean shaven and has an earring in his right ear. The folds of the king's robe are held in place by a clasp at the neck.

On the reverse, a helmeted figure (Athena?) carrying a shield and holding a lance over the shoulder is walking left. The lance is pointed on each end. The figure's garment folds are visible near the feet. A clockwise circular Greek legend enclosed within a circle reads from the bottom: ΒΑΣΙΛΕΩΣ ΑΡΤΑΞΕΡΞΕΩ ΘΕΙΟΥ. The letters ΙΔ (possibly representing the numeral 14) are seen in the right field behind the shield; the monogram ⚹ is seen beneath the figure's feet.

The coin was analyzed using non-destructive SEM-EDS with the kind assistance of metallurgist Robert F. Dragen, President, Aspen Consulting, Inc., Milwaukee, Wisconsin.[9] Chemical composition of the coin's exterior surface alloy was determined at three locations without preliminary surface preparation: the obverse field in front of the king's nose, the reverse legend above the soldier's helmet, and at the edge near the top of the coin. The analytical results are provided in the table below as means +/− one standard deviation.

SEM-EDS Surface Composition of the Artaxerxes Drachm

Percentage by Weight +/− 1 SD (n=3)

Silver	92.53 +/− 1.17
Copper	4.08 +/− 0.41
Gold	0.61 +/− 0.53
Lead	1.56 +/− 0.85
Silicon	0.67 +/− 0.70

[9] The SEM-EDS procedure is described by L. A. Saryan and R. F. Dragen, "A Microchemical Investigation of Suspected Plating on Thirteenth-Century Armenian Silver Trams," *Armenian Numismatic Journal* 20, 3 (September 1994), pp. 53–61.

Aluminium	0.50 +/− 0.16
Iron	0.01 +/− 0.01
Titanium	0.04 +/− 0.07

The presence of lead and gold in concentrations of ca. 1% each indicate that the coin was struck from ancient metal (highly purified silver is used for modern coinage). The presence of silicon, aluminum, and titanium on the coin's surface probably result from minor contamination with soil. This analysis reflects surface composition which, for a variety of reasons, may differ from the coin's internal alloy.

The coin appears to have been struck from engraved dies on a flan of proper weight for a late Hellenistic drachm or a Roman denarius.[10] Chemical analysis of the coin's surface indicates that it was struck from ancient metal. Fine cracks at three locations near the edge indicate that the coin was die struck as opposed to being cast (forgeries and fantasies are often manufactured by casting). The surfaces of the coin have been cleaned but do not show evidence of casting.

Several stylistic features of the coin should be noted. The design of the tiara differs significantly from the well-known coins of Tigranes the Great (the most readily available model for creation of an Artaxiad fantasy). Notably, the paired eagles, lappet, and fanion universally observed on the tiara of Tigranes are absent on the coin published here. Furthermore, the shape of the tiara is more conical than those of Tigranes II. In these respects, the depiction more closely resembles coins of the later Artaxiad dynasty.[11] Some design features seen on this coin are known on contemporary Roman-Armenian coins (discussed below), such as the spear and helmet. The technical execution of this coin is generally quite good, but the type does not closely resemble any known authentic coins.

The inscription and monograms are of considerable interest. The Greek inscription on this coin referring to a King Artaxerxes is curious since no kings of this name are known for the Artaxiad dynasty. Three kings are known with the similar name Artaxias (Artashes). The names

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[10] Bedoukian, *CAA*, p. 76, gives the weights of four known silver coins of Artavasdes IV-Augustus (dated A.D. 4–6): 3.53, 3.70, 3.54, and 3.50 g (average, 3.57 g).

[11] See above, n. 6.

Artaxias and Artaxerxes are probably equivalent renderings of the king's name in Latin and Greek respectively. In one source, it is noted that the city of Artaxata is sometimes referred to in Greek sources as "Artaxerxoktiste."[12] The use of a circular inscription is also noteworthy, as this feature did not generally appear on Artaxiad coins until the time of Artavasdes IV/Augustus (A.D. 4–6) and Tigranes V/ Erato (A.D. 6).[13]

The monogram beneath the figure's foot can be resolved to read Artaxata as the mint city. Elements of the Greek letters **A P** and **T** are visible. This monogram corresponds exactly to that seen on two exceedingly rare copper coins from the city of Artaxata.[14] Finally, the field letters may be read as the numeral 14, suggesting the regnal year during which the coin was struck.

The coin's fabric is flatter than is usually seen on Artaxiad dynasty coins. The upper point of the double-pointed spear is strange and gives the impression of having been altered; likewise, the figure's face appears rather unnatural. These irregularities may have been the result of later alteration or lack of skill on the part of the engraver.

This coin incorporates into its design several virtually unknown facts about ancient Armenian coinage. (1) Tiaras which show a wavy floral ornamentation replacing the twin eagles are only seen clearly on the rare tetradrachms of Artavasdes, published after 1960. (2) The monogram of the city of Artaxata is known only from two very rare coins published circa 1912. (3) Finally, the name King Artaxerxes (used as the Greek equivalent of Artaxias) is correct for a coin with a Greek inscription, although in historical works the name Artaxias (and its Armenian

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[12] T. Kh. Hakobyan, S. T. Melik-Bakhshyan, H. Kh. Barsegyan, *Dictionary of Toponymy of Armenia and Adjacent Territories*, vol. 1 (Yerevan: Yerevan University Press, 1986), pp. 493 and 501 (in Armenian). The city name is transliterated "Artak'serk'sok'tiste." This seems to be a rare usage.

[13] Bedoukian, *CAA*, 163–67. Nercessian, *ACTV*, coins 180–84.

[14] Bedoukian, *RCM*, pp. 191–94. Following the suggestion of the venerable French numismatist Ernest Babelon, these coins are traditionally ascribed to the reign of Commodus (late second century A.D.). More recent research dates these coins earlier: see M. L. Chaumont, "A propos d'une ere d'Artaxata, Capitale de la grande Armenie," *Revue des Etudes Armeniennes*, vol. 18 (1984), pp. 397–409, and R. E. Vardanian, "On the Dating of Two Groups of Armenian Coins of the Hellenistic Epoch," *Patma-Banasirakan Handes*, 1987, 2–117, pp. 195–207 (in Russian).

equivalent Artashes) is used exclusively. Artaxiad fantasies (except imitations of Tigranes the Great)[15] are rare simply because the coinage of this dynasty is unfamiliar to would-be counterfeiters.[16] These arguments are advanced as indications of the coin's authenticity.

No similar coins have yet been revealed from an official excavation. The logical site for such a discovery is ancient Artaxata, which is located just south of Yerevan in the Ararat Valley. Archaeological research has been carried out at this site for several years, but to date only about 10% of the territory of this early Armenian capital has been excavated.[17] Some important numismatic finds have been recorded from Artaxata, including a hoard of silver drachms of Tigranes the Great,[18] and future excavations can be expected to reveal new numismatic treasures.

This coin must be presumed to belong to either Artaxias I (189–160 B.C.), Artaxias II (30–20 B.C.), or Artaxias III (A.D. 18–34). Stylistically, it belongs to the late first century B.C. or early first century A.D., i.e., toward the end of the Artaxiad dynasty until the rise of the Arsacid dynasty of Armenia.

Artaxias I, the founder of the Artaxiad dynasty, was a king of legendary prowess and skill. Despite the testimony of Armenian historian Movses Khorenatsi that he struck coins in his own image,[19] no

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[15] Nercessian, *ACTV*, pp. 178–82, lists several forgeries pertaining to Tigranes the Great.

[16] L. A. Saryan, "Of Forgeries and Fantasies: Two Controversial Armenian Coins," *Armenian Numismatic Journal* 13, 1 (March 1987), pp. 2–6; V. Matiossian, "Who Was Zariadres? Some Notes on an Artaxiad Coin," *Armenian Numismatic Journal* 21, 1 (March 1995), pp. 17–19.

[17] I am indebted to Prof. Gregory Areshian, presently at the University of Wisconsin-Platteville, for this information.

[18] Kh. A. Mousheghian, "The Armenian Hoard of Artaxata," *Armenian Numismatic Journal* 4 (1978), pp. 105–24 (in Armenian).

[19] Movses Khorenats'i, *History of the Armenians*, translated by R. W. Thomson (Cambridge, MA: Harvard University Press, 1978), p. 147 (hereafter, Thomson). The career of Artaxias I is discussed in *Armenian Soviet Encyclopedia*, vol. 2 (Yerevan: Armenian SSR Academy of Sciences Press, 1976, in Armenian) (hereafter *ASE*), p. 139, and in *History of the Armenian People*, vol. 1 (Yerevan: Armenian SSR Academy of Sciences Press, 1971, in Armenian) (hereafter, *HAP-1*), pp. 521–51 and passim.

coins attributable to Artaxias I have been recognized so far. The inscriptions of Artaxias I found on some stone boundary markers are in Aramaic, not Greek.[20] Attribution of this coin to Artaxias I does not appear plausible.

Artaxias II (30–20 B.C.), was the only son of Artavasdes II who escaped capture by Mark Antony; he found refuge in Parthia and was installed as king by the Armenian nobles. As a sworn enemy of the Romans he devoted most of his energy to opposing Roman efforts to regain a foothold in Armenia.[21] Some aspects of the subject coin, notably the tiara ornamentation and form of the legend referring to the king's divinity, could indicate that this coin was struck by the immediate Armenian successor of Artavasdes II. However, no silver coins of Artaxias II are known, and his bronze coins are exceedingly rare and one might even add questionable.[22] There is insufficient evidence at this time to compare the subject coin to any known coins of this king.

The preponderance of the evidence suggests attribution of this coin to Artaxias III (Zeno), who ruled Armenia from A.D. 18–34.[23] The rule of this king falls into the interregnum between the fall of the Artaxiad dynasty (A.D. 6) and the rise of the Arsacid dynasty of Armenia (A.D. 53), during which period Armenia was controlled by a succession of foreign rulers.

In A.D. 18, the Romans sent Germanicus, a renowned soldier and a skilled diplomat, to Armenia to resolve the matter of the Armenian succession. Germanicus had already added Cappadocia, Commagene, and other small kingdoms to Roman territory, and wished to maintain Armenia's neutral status. It was in Rome's interest to select a candidate who would be acceptable to the people, while at the same time not arousing the enmity of the Parthians. Germanicus settled upon

[20] On the stelae of Artaxias I, see *HAP-1*, pp. 527–28 and 535, and Thomson, pp. 198–99.

[21] The history of Artaxias II is given in *ASE*, vol. 2, pp. 139–40, and in *HAP-1*, pp. 626–31.

[22] For the coins of Artaxias II, see Nercessian, *ACTV*, p. 77.

[23] The history of Artaxias III is given in Bedoukian, *RCM*, pp. 24–29. Also see *ASE*, vol. 3, p. 686 (1977) and *HAP-1*, pp. 712–13

Zeno, the son of King Polemon and Pythodoris of Pontus, whose candidacy was considered acceptable by the Armenians since Zeno had grown up among them and accepted their customs. With great pomp, Germanicus crowned Zeno as king in the city of Artaxata, renaming him Artaxias (III) to enhance his prestige as the inheritor of the throne of the great Artaxias I.[24] Artaxias reigned peacefully until his death in A.D. 34.

Paul Bedoukian, in *Roman Coins and Medallions Relating to Armenia*, writes that Artaxias III, who ruled 16 years, would have been expected to have left numerous coins. However, we know only of some very rare silver drachms and didrachms, of a single type, commemorating the coronation of Artaxias by Germanicus. Some experts believe that these were struck contemporaneously in Armenia and others believe they were struck later in Cappadocia.[25] The coins have Latin legends and depict Germanicus placing a lofty crown on the head of Artaxias.[26] Germanicus holds a spear upright, and on drawings of the drachm (but not the didrachm) appears to be wearing a helmet. Since Artaxias III aspired to the prestige and glory of the Artaxiad dynasty it is understandable that he would have worn an Artaxiad tiara. These offer points of stylistic resemblance between the new coin and known issues.[27]

[24] According to the Roman writer Tacitus, Zeno was renamed Artaxias because he was crowned in Artaxata; Bedoukian (*RCM*, pp. 24–25) considers this less likely than the explanation given here.

[25] Bedoukian, *RCM*, pp. 27–28, provides convincing arguments to support the suggestion that these coins were struck in Armenia around A.D. 18, rather than after the death of Artaxias III as suggested by Mattingly and Sydenham. Descriptions of these coins may be found in Bedoukian, *RCM*, pp. 25–27, and Nercessian, *ACTV*, p. 88; also see H. A. Seaby, *Roman Silver Coins*, vol. II (London: Seaby Publications, 1979), pp. 3–4, and S. W. Stevensons, *A Dictionary of Roman Coins*, (London: Seaby Reprint, 1964), p. 690.

[26] Ben L. Damsky, "The Stadium Aureus of Septimius Severus," *American Journal of Numismatics*, vol. 2 (1990), pp. 77–105, esp. pp. 97–98, notes that these two coins are the first Roman issues depicting a coronation, and points out that Germanicus is performing the actual coronation to demonstrate Roman authority.

[27] Some contemporary Roman coins referring to Armenia show similar helmets: Bedoukian, *RCM*, pp. 54–56, 18 and 19.

The new coin described in this article is tentatively attributed to Artaxias III. The coin may have been struck in the fourteenth year of Artaxias' reign (A.D. 32) at the mint of Artaxata in the Ararat Valley, not far from Armenia's present capital, Yerevan. Hopefully, additional examples will be discovered in a secure archaeological context enabling us to confirm this supposition.

A STUDY OF THE CHEMICAL COMPOSITION OF ROMAN SILVER COINAGE, A.D. 196-197

Kevin Butcher and Matthew Ponting
with a Contribution by Graham Chandler.

Introduction

The early denarius coinage of Septimius Severus was issued at a number of different mints in the Roman empire in addition to the mint of Rome. This phenomenon is important because it represents a departure from the established pattern of minting seen in the second century A.D., where denarii were generally struck only at Rome. It is also important to note that this departure was not long term, and that production was again centered on Rome by the beginning of the third century. The location of the non-Rome mints has been a subject of debate. That one of them was Alexandria in Egypt is now generally accepted, although its output was fairly limited and was not important in terms of the volume of coinage circulating in the empire. It operated only for a short period, ca. A.D. 194-95. More significant are other groups of coins, usually described as "eastern," and sometimes specifically attributed to two Syrian mints, Laodicea ad Mare and Emesa, which struck coins between A.D. 193-94 and 202. We do not propose to discuss the attributions to mints in any detail in this article, but it is worth pointing out that the attribution of these coins to particular mints rests more on speculation based on historical events in the reign of Severus than on any hard evidence, such as hoards or finds.

There is a second significant aspect to the denarius coinage of Septimius Severus. In A.D. 194 he debased the denarius of Rome, establishing a new lower standard. The significance of this debasement cannot be overstated. Its effect can be seen in hoarding patterns throughout the empire, and it can truly be considered as a watershed between hoarding patterns of the second century and patterns of the first half of the third century. Hoards containing large numbers of Severan post-debasement coins usually contain few pre-debasement denarii, and vice versa. That some of the pre-debasement hoards close after the debasement can be seen from some of the later strays, and we note in particular the occasional coins of the usurper Clodius Albinus, struck ca. A.D. 196. We will not go into the possible reasons for these patterns here, but it is important to note that the hoard evidence implies that contemporaries saw the pre- and post-debasement coins as being different in some way. This may be simply because they were debased, or it may reflect the fact that the new coins had a different value compared to, say, the gold coinage. If the post-reform coins were perceived as debased and/or different and they were intended to form the backbone of Rome's silver coinage from A.D. 194 onward, Severus would have needed to put more of the new denarii into circulation quickly and efficiently, and one interpretation of the opening up of regional mints is that it was a response to this need.

Some of these observations will be explored in later studies of the Severan silver coinage. The purpose of our investigations here is twofold. First, to determine the silver standard used by Severus after the debasement and to obtain a clearer picture of the metallurgy of the Severan silver coinage. Second, to examine the minor and trace element profiles of some of the different mints, not in order to try to discover their locations, but to determine differences or similarities in their elemental characteristics which may relate to the source of metal and/or differences in the production technologies.

The Coins Analyzed

Four groups of coins, all of the period 196-97, were chosen for the present study:
1) Denarii of Rome belonging to Severus's eighth imperatorship (**IMP VIII**);

2) Denarii of an uncertain eastern mint, also of Severus' eighth impe-
ratorship;

3) Denarii of an uncertain eastern mint, of Severus's eighth and ninth
imperatorship (**IMP VIII** and **IMP VIIII**);

4) Denarii of the usurper Clodius Albinus, struck in the western
empire.

These groups were chosen with a particular relationship between the
two groups of eastern coins in mind. They are both traditionally consi-
dered Syrian, and even to be consecutive products of the same mint
(Laodicea ad Mare), although stylistically and typologically they are
quite different. The second group listed above is often called "Laodicea
old style" and the third group "Laodicea new style." A recent article
which discusses these coins restates the traditional view: "the 'old style'
series is undoubtedly Eastern, and I do not believe that it can persua-
sively be contended that the 'new style' is not a continuation from the
same mint."[1] As a control it was thought useful to use two groups of
coins which are relatively plentiful and which we know are not eastern,
the products of Rome and the denarii of Clodius Albinus which were
probably struck in Gaul. These could then be compared with the
eastern coins.

The coins selected for analysis were all from the collection of the
British Museum. For assistance with this task we would like to thank
Andrew Burnett, Roger Bland, and Jonathan Williams of the Depart-
ment of Coins and Medals, who very kindly placed the relevant coins
at our disposal. The individual coins were selected to cover several
different reverse types per group, but it should be noted that we were
also restricted by the suitability of individual specimens for our
sampling technique.

Group 1. Septimius Severus, Rome.

1. BMC 151   ADVENTI AVG FELICIS SIMO
2. BMC 152   ADVENTI AVG FELICIS SIMO

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[1] Bickford-Smith, R. A., "The Imperial Mints in the East for Septimius Severus:
It Is Time to Begin a through Reconsideration," *RIN 96* (1994/95), pp. 53-71.

3. BMC 153   ADVENTI AVG FELICIS SIMO
4. BMC 156   ADVENTI AVG FELICIS SIMO
5. BMC 157   ARAB ADIAB COS II PP
6. BMC 161   FORTVNAE REDVCI
7. BMC 167   LIBERALITAS AVG II
8. BMC 169   MVNIFICENTIA AVG
9. BMC 178   VOTA PVBLICA
10. BMC 180   VOTA PVBLICA

Group 2. Septimius Severus, Laodicea old style

1. BMC 441   CERERER VGIF
2. BMC 442   FORT REDVC
3. BMC 443A   FORT REDVC
4. 1979 6-14-16   FORT REDVC
5. BMC 444   FORT REDVC
6. BMC 445   LIBER AVG
7. BMC 446   LIBERTA AVG
8. 1947 10-1-10   LIBERTA AVG
9. 1946 10-4-827   MART VICT
10. BMC 449   MONET AVG

Group 3. Septimius Severus, Laodicea new style, obv. ending IMP VIII

1. BMC 451   HERCVLI DEFENS
2. 1979 6-14-17   PM TRP V COS II PP
3. BMC 456   PROVIDENTIA AVG

   Caracalla Caesar, Laodicea new style
4. 1946 10-4-829   SECVRITAS PERPETVA
5. BMC 461   SECVRITAS PERPETVA

   Septimius Severus, Laodicea new style, obv. ending IMP VIIII
6. BMC 463   PM TRP V COS II PP
7. BMC 466   PROFECTIO AVG

Group 4. Clodius Albinus Augustus, obv. legend IMP CAES D CLO ALBIN AVG

1. 1946 10-4-761   SPE AVG COS II

2. BMC 267   SPE AVG COS II
3. BMC 268   VICT AVG COS II

   Obv. legend IMP CAE D CLO SEP ALB AVG

4. BMC 269   CLEMENTIA AVG COS II
5. 1946 10-4-764   FIDES LEGIONIS COS II
6. BMC 272   IOVIS VICTORIAE COS II
7. BMC 273   MARS PATER COS II
8. BMC 275   SAECVLI FEL COS II
9. 1946 10-4-760   SAECVLI FEL COS II
10. BMC 277   VICT AVG COS II

Analytical Problems

The denarius coinage of the Severan period has been the focus of a number of analytical projects aimed at gaining a better understanding of the processes of corrosion and segregation in base-silver alloys. Alloys of silver and copper which contain less than about 90% silver will generally contain two phases: one rich in copper and one rich in silver. Because of the difference in chemical reactivity (electrode potential) the less noble (more electro-negative) phase will corrode preferentially to the silver-rich phase. This process leads to the surface layers of the alloy losing copper to the environment which results in an apparent enhancement of the silver content. For coins, the problems of natural copper-depletion are likely to have been further exacerbated by a blanching process conducted at the mint prior to striking. This process, involving treatment with an organic acid, would have been necessary to remove the layer of black copper oxide which would have inevitably formed on the freshly cast coin blank. However, it seems unlikely that the silver enrichment effect accompanying such a treatment[2] would have gone unnoticed at the mint, especially as the

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[2] By the same chemical processes as undergone during corrosion, the preferential removal of the less electro-negative copper-rich phase.

debased alloy would have looked very yellow unless treated in this way. The maintaining of a currency which at least looked as if it were made of fine silver would have been of considerable importance to the issuing authority, and this effect, although fortuitous in the first instance, would certainly have been exploited.[3]

Condamin and Picon were the first to examine the preferential corrosion of copper in denarii of Septimius Severus[4] and concluded that the surface silver content of debased silver-alloy coins will be markedly higher than the silver content of the alloy within the coin. They attributed this solely to the effects of corrosion. They also demonstrated that the metal within the coin was more truly representative of the original alloy. In particular this article demonstrated the problems of "non-destructive" Neutron Activation Analysis (NAA) as applied to silver-alloy coins. Used in this way, NAA accurately analyses the whole coin as it is today, including the surface enriched areas. A total NAA analysis gave a figure of 53% silver compared with an internal silver content of 45% for a Severan denarius.[5] Furthermore, it was also shown that the enriched area can often extend some way into the coin. Despite this demonstration of serious problems with such approaches, as well as other related work, notably by Cope,[6] many have claimed to obtain accurate and meaningful results from surface analyses.[7] Carter's technique, as applied to silver-alloy coins, was to air-abrade the area to be analyzed removing a total *estimated* 60 μm of surface metal. This was the amount of metal removed in order to achieve a repeatable reading (three repeats starting at 20

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[3] Examples of blanching facilities have been found in medieval mint workshops in Norway (McLees, L. H., "The Late Medieval Mint Workshops at the Archbishop's Palace, Trondheim, *Antiquity* 68 [1994], pp. 264-74).

[4] Condamin, J., and M. Picon, "The Influence of Corrosion and Diffusion on the Percentage of Silver in Roman Denarii," *Archaeometry* 7 (1964), pp. 98-105.

[5] Condamin and Picon, p. 104.

[6] Cope, L. H., "The Metallurgical Analysis of Roman Imperial Silver and Aes Coinage," pp. 3-47, and "Surface-Silvered Ancient Coins," pp. 261-78, in Hall and Metcalf, Eds., *Methods of Chemical and Metallurgical Investigation of Ancient Coinage*, Royal Numismatic Society Special Publication 8 (1972).

[7] Condamin and Picon, above, n. 4.

μm, ending at about 60 μm), the assumption being that this is representative of the main bulk of the coin. However, it appears that this is misleading. There is a notable discrepancy between the silver values for Severan denarii issued after A.D. 193 as reported by Condamin and Picon[8] (45%) and as reported by Carter.[9] Carter gives us an average figure of 58.4% $\pm$ 0.5% (normalized) based on ten analyses.[10] This is a discrepancy of over 13%. Yet it is this method (or a variant of it) which has been repeatedly used for numismatic research. Indeed, it is this method which was used by Walker in his magnum opus *The Metrology of the Roman Silver Coinage*[11] and gave a mean silver value of 57.6% for the same issues analyzed by Carter.[12] This discrepancy clearly needs explaining and suggests that the abrasion technique does not, in all cases, produce a representative analysis. Previous work by the authors[13] has looked at Roman provincial silver coinages and has demonstrated that surface analyses, such as those by Walker, invariably overestimate the silver content and also give a false impression of great inconsistency. Both these effects are the result of a technique which only analyzes metal from within the enriched zone.

Both the natural and artificial processes of enrichment have similar results. However, the striking of the coin after 'blanching' will compress and consolidate the silver-rich zone into a continuous and compacted layer. This can clearly be seen in the structure of such coins under the scanning electron microscope (SEM) (Fig. 1).

[8] Condamin and Picon, above, n. 4.

[9] Carter, G. F., "Reproducibility of X-Ray Fluorescence Analyses of Septimius Severus Denarii," *Numismatic Chronicle* 19 (1978), pp. 67-73.

[10] See Carter, p. 70.

[11] Walker, D. R., *The Metrology of the Roman Silver Coinage*, part 3: *From Pertinax to Uranius Antonimus*, Oxford, BAR Supplementary Series 40 (1978).

[12] Condamin and Picon analysed 54 coins of between 194 and 211 A.D. and gave a figure of between 45% and 50% for 36 of the coins. Walker (1978) analyzed somewhat more, giving averages of 78.71%, 65.84%, 66.5%, 61.4%, 57.59%, 58.88%, 55.58%, 55.53%, 57%, 57.67%, 57.16%, 54.75%, 57.07%, 53.21%, 57.63% and 55.17% (st.dev of 4 - 8) for his different issue groups within that period.

[13] Butcher, K. E. T. and M. J. Ponting, "Rome and the East. Production of Roman Pronvincial Silver Coinage for Caesarea in Cappadocia under Vespasian, A.D. 69-79," *Oxford Journal of Archaelogy* 14, 1 (1995), pp. 65-77.

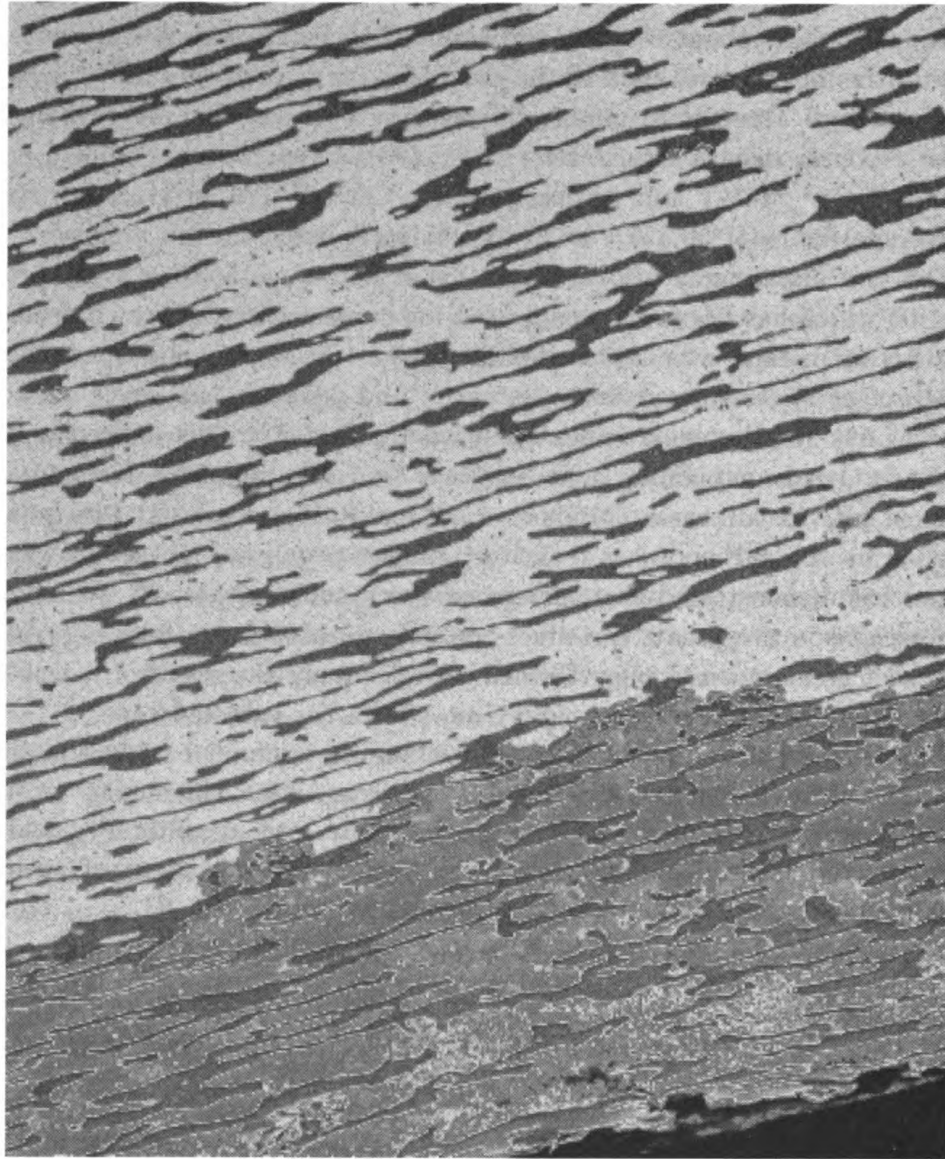Fig. 1 SEM photomicrograph of a cut section of a 50:50 silver:copper alloy Roman provincial coin showing a typical two-phase structure in the interior and a mineralized copper-phase toward the surface (mid gray is silver rich, light gray is copper rich, and dark gray is mineralized copper rich). The edge of the coin is to the bottom left. The strong alignment of the phases is the result of striking.

PERCENTAGE DATA FOR SEVERAN DENARII

No.	Ref.	Au %	Sn %	Ag %	Cu %	Pb %	Bi %	Zn %	Fe %	Ni %	Total %
Septimius Severus, Laodicea 'old style,' IMP VIII											
1	BMC 441	0.24	<0.5	41.0	40.5	0.34	0.07	0.032	<0.03	0.058	82.1
2	BMC 442	0.07	<0.5	42.9	58.4	0.22	0.11	0.016	<0.03	0.129	101.7
3	BMC 443a	0.25	<0.5	35.0	61.0	0.24	<0.03	0.011	<0.03	0.071	96.6
4	1979 6-14-16	0.33	0.61	46.1	53.1	0.24	0.06	0.013	<0.03	0.102	99.8
5	BMC 444	0.04	<0.5	50.2	50.9	0.13	0.18	0.010	0.05	0.057	101.3
6	BMC 445	0.44	<0.5	47.7	52.2	0.12	0.10	0.026	<0.03	0.163	100.5
7	BMC 446	0.29	0.53	47.5	54.8	0.14	0.11	0.018	0.04	0.041	102.8
8	1946 10-4-827	0.26	<0.5	47.5	51.4	0.32	0.06	0.037	0.04	0.087	99.6
9	1947 10-1-10	0.36	<0.5	49.0	48.8	0.38	0.03	0.036	0.04	0.051	98.5
10	BMC 449	0.19	<0.5	48.4	54.9	0.30	<0.03	0.049	0.05	0.127	103.9
Septimius Severus, Laodicea 'new style,' IMP VIII											
11	BMC 451	0.43	<0.5	47.0	51.9	0.30	0.06	0.027	0.11	0.119	99.7
12	1979 6-14-17	0.28	<0.5	48.4	49.7	0.28	<0.03	0.015	0.09	0.374	99.0
13	BMC 456	0.30	<0.5	47.8	50.5	0.29	0.03	0.026	0.05	0.113	98.9
Caracalla Caesar, Laodicea 'new style'											
14	1946 10-4-829	0.37	0.69	48.9	50.7	0.15	0.04	0.024	0.07	0.170	100.3
15	BMC 461	0.35	0.61	48.8	52.6	0.24	<0.03	0.037	0.12	0.101	102.1
Septimius Severus, Laodicea 'new style,' IMP VIIII											
16	BMC 463	0.29	1.05	46.9	50.6	0.62	<0.03	0.033	0.14	0.142	98.6
17	BMC 466	0.33	0.93	47.7	49.5	0.48	<0.03	0.026	0.13	0.226	98.2
Clodius Albinus, Augustus											
25	BMC 268	0.40	<0.5	84.9	13.6	0.48	<0.03	0.012	0.04	<0.01	99.4
26	BMC 267	0.43	<0.5	80.0	18.1	0.51	0.03	0.028	<0.03	<0.01	99.1
27	1946 10-4-761	0.48	<0.5	76.3	23.3	0.55	<0.03	0.068	<0.03	<0.01	100.6
21	BMC 277	0.24	<0.5	75.2	23.8	0.36	0.03	<0.003	0.03	0.010	99.6
22	1946 10-4-760	0.36	<0.5	79.1	20.5	0.37	0.05	0.007	<0.03	0.014	100.3
23	BMC 275	0.62	<0.5	87.7	10.5	0.74	0.05	0.026	<0.03	0.021	99.6
	BMC 272	0.35	na	76.3	23.5	0.26	0.03	<0.003	<0.03	<0.01	100.4
28	BMC 273	0.41	<0.5	81.6	24.1	0.23	0.04	0.003	0.03	<0.01	106.3
29	1946 10-4-764	0.52	<0.5	69.7	25.8	0.51	<0.03	0.046	0.03	0.012	96.5
30	BMC 269	0.36	<0.5	73.5	25.4	0.23	<0.03	0.012	<0.03	0.010	99.5
Septimius Severus, Rome, obverses ending IMP VIII											
31	BMC 153	0.16	<0.5	43.5	52.7	0.60	<0.03	0.025	0.07	0.035	97.0
32	BMC 156	0.28	<0.5	46.1	52.3	0.53	0.04	0.024	<0.03	0.031	99.2
33	BMC 152	0.16	<0.5	46.6	54.0	0.46	0.16	0.015	0.06	0.035	101.2
34	BMC 151	0.32	<0.5	46.8	51.3	0.48	<0.03	0.025	0.05	0.016	98.9
35	BMC 157	0.13	<0.5	47.6	51.2	0.44	0.21	0.007	0.06	0.021	99.3
36	BMC 161	0.33	<0.5	44.4	52.9	0.50	0.05	0.030	0.05	0.016	98.2
37	BMC 178	0.30	<0.5	46.3	55.5	0.49	0.05	0.055	<0.03	0.017	102.7
38	BMC 180	0.25	<0.5	44.8	51.8	0.38	0.05	0.012	0.03	0.015	97.2
39	BMC 167	0.32	<0.5	46.8	51.4	0.48	0.03	0.040	0.06	0.020	99.0
24	BMC 169	0.34	<0.5	46.4	51.5	0.53	0.05	0.027	0.06	0.012	98.8

The zone enriched by corrosion alone will still have the different phases clearly visible, but many of the copper-rich "lenses" will be mineralised or empty. The combination of both processes results in a silver rich zone of broadly two compositions extending an unpredictable distance into the coin. The consolidated blanched layer right at the surface will be of pure silver, possibly over 90%, but will be only a few microns thick. The corroded layer will be less fine, and very patchy, with some areas being more corroded than others, depending on the original structure. This will often extend to some depth and will be of a higher silver content than the original alloy. Indeed, in certain cases this corroded zone may extend throughout the entire coin, making an accurate analysis impossible. Consequently, the repeated abrasion and analysis technique as developed by Carter and applied by Walker will avoid the blanched layer but mistakenly analyze the corroded zone beneath. The results bear this out, with only Walker's lowest figures approaching the real value. Furthermore, the inconsistency which is apparent in Walker's figures from the high standard deviations is a result of the unpredictable depth of the corroded zone and the variability of the corrosion effects.

This study reassesses the fineness of the denarius coinage of this period, in the light of the above discussion, by analyzing samples of metal taken as drillings from the "heart-metal" of selected coins. The analytical technique has been described in detail elsewhere.[14]

RESULTS

Silver Content and the Problem of Standards

The silver contents for the Severan issues agree very well with the findings of Condamin and Picon, being around 46%, and confirm the unreliability of Walker's figures for the reasons discussed above. The silver content of 46% is also rather more consistent than Walker's 55-60% figure, having a relative standard deviation (RSD) of 2.8 compared to 10.5 for Walker's figures. The contemporary denarii of Clodius Albinus also have a lower mean silver content of 78.4%

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[14] See Butcher and Ponting, pp. 67-69.

compared to Walker's 89.2%. However, this does not affect Walker's conclusion that Albinus's denarii were struck on the earlier Flavian standard. Our reanalysis of Flavian denarii has shown Walker's figures to be equally inaccurate with 78.7% being the newly estimated mean value.[15]

Silver metal as perceived in antiquity was very different from elemental silver as measured by modern analytical techniques. The processes of smelting and refining silver from its various ores could not produce chemically pure silver. Traces of other elements present in the original ores were inevitably carried through the processes and remain to be found in the coins themselves. Silver in antiquity was commonly produced from argentiferous lead ores or from other ores using processes which required the addition of lead.[16] In either case argentiferous lead metal was produced, where the silver occurs as a minor component in the lead together with minute traces of gold and bismuth, etc. coming from the original ore. In order to extract the silver from the lead a second process called cupellation was used. This involved heating the metal to about 1000° C in a strong air flow which oxidized the lead and most other impurities. Only the elements not readily oxidized would remain in their metallic state. These consisted primarily of the silver and any gold in the original ore which also would have been carried through into the silver. Certain other elements would also have been difficult to remove by cupellation, notably bismuth. Consequently any silver produced by this process will contain traces of gold similar in concentration to the original ore and possibly traces of bismuth dependent on ore type used. Traces of lead will also invariably remain as complete cupellation was rarely achieved, especially in large scale operations as were the case in the Roman period. The silver which would have been used to make the coinage alloy would therefore contain these trace impurities. Roman silver is generally considered to contain between 0.05% and 2.5% lead, 0.1% to 0.5% gold and, generally, 0.01% up to 1% bismuth.[17]

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[15] See No. 13. (1995) pp. 67-69. The fact that in this case Walker's conclusions are valid should not lead the reader into thinking that in general his conclusions about comparative silver standards are valid.

[16] Craddock, P. T., *Early Metal Mining and Production* (Edinburgh, 1995), p. 213.

[17] See Craddock, p. 213.

This means that up to 3% of the metal which was added to the melting pot as "silver" was not silver. It therefore seems sensible to regard the fineness of an ancient coinage as being the combined silver, gold, lead, and bismuth contents. However, by a small scale cupellation or "fire assay" virtually all the lead can be removed, and this may have been the technique employed to establish the purity of silver in antiquity, as was certainly the case by the twelfth century.[18] It is therefore likely that the silver refined on large scale cupellation hearths (down to around 98% fine silver)[19] would have been known to be less than pure by the fire assaying, if this was used as a quality control. The question then is whether the standard on which the coinage was struck took this fact into consideration. Certainly this was the case in medieval England, where the sterling standard was calculated as 92.5% (silver plus gold) and excluding any lead present from large scale cupellation.[20] However, if we calculate the fineness of the Severan denarii as being the sum of the silver, gold, and lead we arrive at a figure close to 50%. The use of a 50% standard would seem very logical compared to a 48.5% or 49% standard and would suggest that the presence of 1% - 2% lead, even if known about, was not deemed sufficient to detract from the required purity of the standard. Given the high level of base metal in the Severan denarii it is, of course, possible for some of the lead to come from the copper.

[18] Pliny does not refer to fire assay specifically, but small scale cupellation of the type is discussed by Percy (1870) in his book *The Metallurgy of Lead* (pp. 209-11) was able to produce *feinsilber* >99% pure and therefore act as a method of checking larger scale operations. This process is certainly of some antiquity, being described in some detail by both Agricola (de Re Metallica Libri xii, Basileae, 1561, pp. 385-492) and Erker (see n. 19 below) as well as having some archaeological basis, for example the small scale cupellation hearths found at Silchester and Hengistbury Head (above, n. 12, see Craddock p. 229). Whether the small scale cupellation process was used habitually as a final stage to produce pure silver or solely as an occasional method to check the purity of the larger scale cupellation product is unimportant. What is important is knowing that this stage is necessary. There is no definite evidence that fire assaying was used during the Roman period, but the technology was certainly available.

[19] Sisco, A. G., and C. S. Smith, Translation of Lazarus Erker's 1580 *Treatise on Ores and Assaying* (1951), p. 64.

[20] Ponting, M. J. (forthcoming), "Analysis of the Coinage of Henry Ist," appendix in M. Archibald and W. Conte, British Museum Occasional Publication.

However, this is likely to be very small given that Roman mints generally seem to have used freshly smelted copper and not recycled scrap.[21] This view is also supported by the low levels of other trace elements which would otherwise indicate the use of recycled basemetal. The one exception to this is with the later Laodicea New style coins of Severus, which have a significant trace of tin present, and may suggest the use of recycled metal containing low levels of tin.

The denarii of Septimius Severus therefore appear to have been struck on a standard of approximately 50% silver with the remainder generally being virtually pure copper. The denarii of Clodius Albinus, on the other hand, were struck of purer metal, probably on a standard of 80% silver, the same as that of the Flavian issues. Both these figures represent easily calculable amounts by the methods and terminology of the time. The 50% standard would be calculated as the silver being alloyed with one part in two of copper, and the 80% as being alloyed with one-fifth part of copper. The silver contents of the issues investigated are shown as box and whisker plots in Fig. 2, which also show the spread of values.
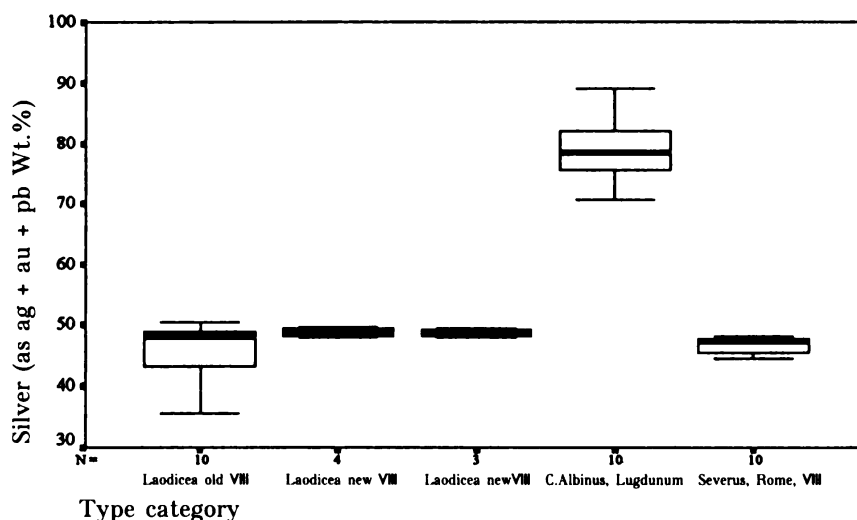

Fig. 2. Finenesses of Severan Denarii

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[21] Ponting, M. J., "Folles and Forgeries: An Appraisal of the Composition of the Roman Copper-Alloy Coinage of the Mid-Third to Mid-Fourth Centuries A.D. from Britain," Ph. D. thesis, University of London (1994), pp. 174-76.

The larger spread apparent in the Laodicean old style coins is due to one particularly base coin, but the consistency of the other Severan coins is very clear. The coins of Clodius Albinus, on the other hand, are somewhat less consistent and this may reflect, inconsistencies in the minting technology (blanching, etc.) or in the quality of the raw silver from which the alloy was made.

Minor and Trace Constituents

The only element apart from silver and copper to occur at levels of 1% and above is tin. This is unusual in Roman silver coinages and is of interest as it only occurs with any consistency in one particular group, the Laodicea new style coins of **IMP VIIII** and the two coins of Caracalla Caesar, ascribed in *BMC* to the period of Severus's Laodicea new style **IMP VIII** coinage. The most probably explanation for this is that recycled low tin bronze was used as the alloying component.

Gold, lead, and bismuth are potentially the most useful elements in distinguishing between the products of different mints for the reasons discussed above. A plot showing the gold and lead contents expressed as a ratio with the silver (to allow comparison across the two different silver contents) clearly shows the Rome issues of Severus as being quite ˙distinct from the issues of Lyon and the east (Fig. 3). The Rome issues have a significantly higher level of lead, calculable as 1.1% in fine silver, whereas the Lyon issues of Clodius Albinus and Severus' Laodicean coins have only about 0.5% lead in fine silver. This probably represents a difference in the cupellation processes and can be used to suggest two different models.

1. Silver produced in the east, and in the western provinces controlled by Clodius Albinus, was the product of smaller scale refining processes more likely to remove a greater proportion of the remaining lead. Or
2. These mints relied more heavily on recycled silver which had been repeatedly recycled over many (hundreds of) years and would there-
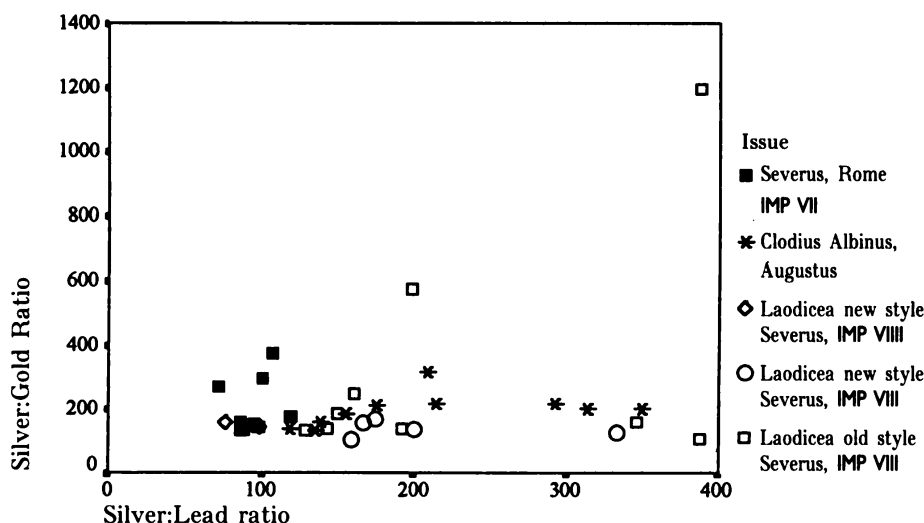
Fig. 3. Silver:Gold and Silver:Lead Ratio Plot

fore have been the product of smaller scale refining processes.[22] This is assuming straight re-use of metal, without any refining, which would have involved the addition of lead. The second model is, perhaps, the most tenable, especially as the gold contents are generally quite homogeneous. This would suggest a supply pool of silver which had been homogenized by repeated remelting and recycling.

The bismuth concentrations, expressed in the same way and plotted against the silver:gold ratios (Fig. 4) clarify the picture. The separation of the Rome and Lyon issues is confirmed. However, a separation is also suggested between the Laodicean old and new styles, with the new style coins generally overlapping the issues of Lyon. Both Rome and Laodicea old style form quite distinct clusters (with one or two outliers) due to their higher bismuth content, whereas the other issues are generally spread out.

[22] Analysis of Roman and Sassanian silver plate has shown a similar difference, with Roman plate generally containing 1%-2% lead and Sassanian silver plate generally containing 0.5% lead (Hughes, M. J. and J. A. Hall "X-Ray Fluorescence Analysis of Late Roman and Sassanian Silver Plate," *Journal of Archaeological Science* 6 [1979], pp. 321-44).

Fig. 4 Silver:Gold and Silver:Bismuth Ratio Plot

The suggestion that the Laodicea old and new styles are compositionally different can be taken further using a standard statistical technique called discriminant analysis. This statistical technique checks the validity of a grouping solely on the mathematical relationships of the compositional variables and gives a probability value that each case (coin)· is correctly grouped. Using only the trace elements present, a discriminant analysis correctly attributed 97.3% (39 out of 40) of the coins to their issue groups. This is a very good result and indicates that there are significant chemical differences between all the issue groups. A plot of the discriminant functions illustrates this (Fig. 5), showing that the most similar groups are Severus' Rome issues and Clodius Albinus's Lyon issues. However, these are groups that we already know clearly differ from each other in their trace element concentrations and serve to illustrate the even greater difference between these and the Laodicean issues. The old and new style coins are well separated and the very different coins of the **SECVRITAS PERPETVA** type and **IMP VIIII** are even more distinct. A closer study of the discriminant statistics shows that, apart from lead, gold and bismuth, iron and nickel concentrations play a significant role in the issue groupings.
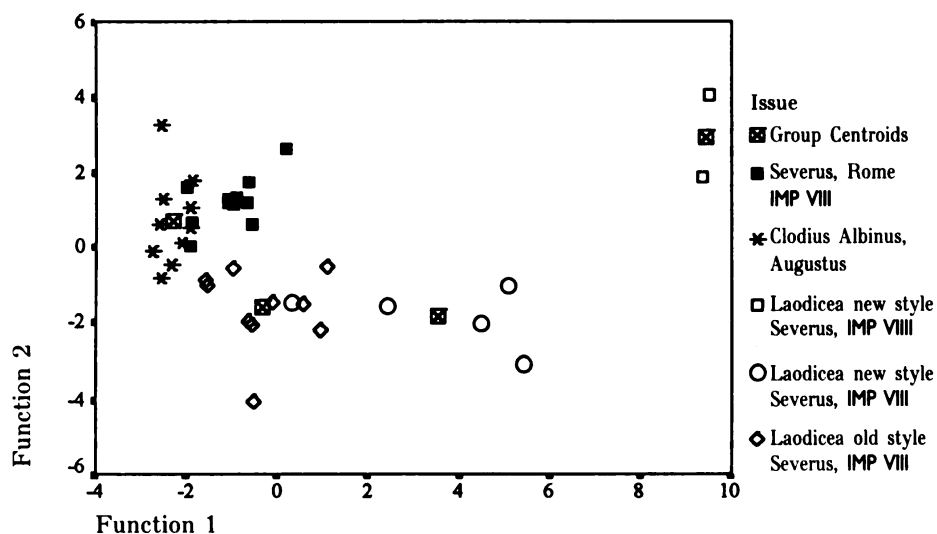
Fig. 5. Plot of First Two Discriminant Functions

This is interesting as these two elements are strongly associated with the copper in the alloy, whereas the others are associated with the silver. Nickel tends to relate directly to the source of the copper ore, with some copper ores containing more nickel than others, whereas the iron relates directly to the smelting and refining technology. Generally speaking, the more highly refined the copper, the lower the iron content[23] or the more frequently remelted (some iron being lost as oxide in every melt). The highest iron contents are found in the new style issues of Laodicea (mean of 0.1%) (Fig. 6) with the Rome (mean of 0.05%) and old style issues overlapping. However, the old style coins generally seem to have the lowest iron contents (mean of 0.03% with several coins below detection limits). It generally appears that the Roman mints used freshly smelted copper which was refined only enough to render it workable, consequently iron content of 0.1% to 0.5% are common in copper-based coins.[24] The higher iron content found in the Laodicean and Rome issues would be broadly consistent

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[23] See n. 13, pp. 73-74, and n. 16, pp. 137-41 for a more detailed discussion.
[24] See above, n. 21.
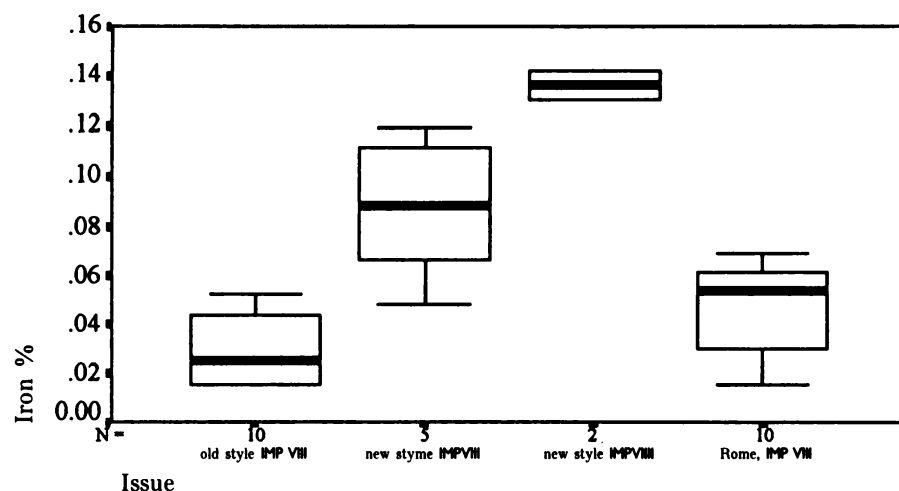
Fig. 6. Iron Content of Severan Denarii

with this level of refining. The lower levels may suggest the use of recycled metal or merely differences in refining standards. The nickel levels are also higher in the new style Laodicean issues (Fig. 7) with a mean of 0.2% against a mean of 0.09% for the old style issues (and an even lower figure of 0.02% for the Rome issues).

Fig. 7. Nickel Content of Severan Denarii

CONCLUSION

The standard of the post-reform Severan denarius is now established as having been 50% cupelled silver and the standard of the coinage of Clodius Albinus issued at Lyon was 80%. This differs significantly from the a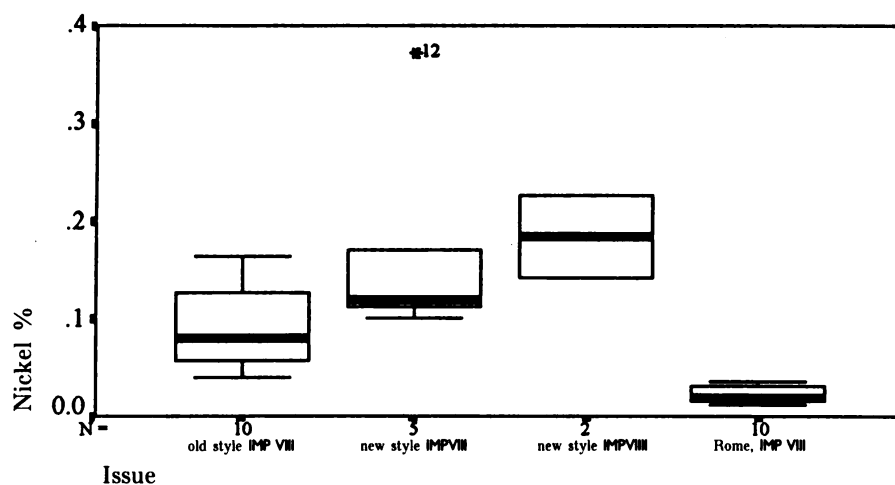nalyses published by Walker, but does not alter the validity of his conclusion that Clodius Albinus was issuing denarii on the Flavian standard. The coinage of Clodius Albinus Augustus is an important phenomenon which deserves further examination: the hoarding pattern observed in the introduction to this article may be explained by the fact that the silver standard of these coins was perceived by contemporaries as being equal to the pre-reform denarii of the late first and second centuries A.D., and that these coins were different from the post-reform denarii. The post-reform Severan standard of 50% is also demonstrably more consistent than Walker's higher standard, as would be expected from the metallurgical study of the minting processes and analytical techniques employed. This 50% silver standard is encountered in other Roman coinages of the first and second centuries A.D., which we have examined elsewhere.[25] These coinages, however, are all Roman provincial coinages, issued in the eastern provinces. Nevertheless, one of the authors has previously suggested a link between this provincial standard and the adoption of the 50% standard for the denarius under Septimius Severus.[26] We hope to be able to examine this possible link at a later date.

The denarii of Clodius Albinus not only differ from those of Severus in their silver content, but also in their trace element concentrations. In particular the bismuth concentrations are generally lower, suggesting the use of different silver sources. The issues of Rome and Laodicea also differ on the very basic level of their silver:gold and silver:lead ratios. However, the Laodicean new style is also compositionally different from the old style on two fundamental levels.

1. The bismuth contents of the old style issues are generally higher, and

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[25] See Butcher and Ponting, above n. 13, pp. 68.

[26] Butcher, K. E. T., "Rhodian Drachms at Caesarea in Cappadocia," *Numismatic Chronicle* 1992, pp. 41-48.

2. The iron and nickel levels are significantly higher in the new style coins than in any of the other groups, with the Laodicean old style coins generally having the lowest iron concentrations.

This gives two independent arguments for the Laodicean old and new styles being the products of two different mints. First the bismuth levels indicate the use of silver from different sources. Second, the iron and nickel levels indicate not only the use of copper from different sources, but also significant differences in the level of refining applied during copper production. This suggests that the copper in the new style coins was generally less well refined and therefore probably freshly smelted. From these results we cannot conclude where the Laodicean old style and Laodicean new style mints were, but there is sufficient evidence to challenge the traditional suggestion that they are the same mint. The most notable compositional group is that comprising the two examples of the Laodicean new style issues of **IMP VIIII** and the two Caracalla Caesar coins. The compositional similarities suggest that the **SECVRITAS PERPETVA** coins of Caracalla should be placed with Severus's coins of **IMP VIIII** (or perhaps with later **IMP X** coins of A.D. 197 which were not analyzed), although the sample is very small and further analyses might uncover **IMP VIII** coins with similar characteristics. Nevertheless, these coins must be seen as a distinct compositional group and point to a marked change in mint practice.

THE ELEPHANT-RIDER DĪNĀRAS OF KUMĀRAGUPTA I

Gerald M. Browne

Justly regarded as one of the miniature masterpieces of Gupta art, the so-called elephant-rider gold dīnāras of the emperor Kumāragupta I (414–55 A.D.) display an obverse legend which has resisted successful decipherment. John Allan knew of only one specimen of this type when he published his *Coins of the Gupta Dynasties and of Śaśāṅka, King of Gauḍa* (London, 1914), and he noted that it bore traces of an uncertain text, perhaps beginning with *kṣiti*[*pati* (p. 88; cf. p. cxx, 152).

Fortunately, several decades later the Bayana hoard yielded three further coins like that in Allan's catalogue but better preserved, as well as four specimens of the same general design but stylistically distinct and with a different reverse.[1] All these coins appeared to A. S. Altekar to contain parts of the same legend, for which he offered the following reconstruction:[2]

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[1] A fifth example of this variety, unfortunately with a very badly damaged legend, was published by H. Śāstri, "Novelties in Gupta Coins," *JASB* 13 (1917), pp. 156–56 (with pl. 7).

[2] I have slightly altered the spelling, in order to bring the transcription into agreement with the practice of western Indologists.

इनॊयुठठान्तुॣ िए्ॕ॑ एॺ॒ ॊयॣ

kṣataripu-Kumāragupto rājatrātā jayati ripūn.

The meter he identified as Upagīti, and he translated the line as "Kumāragupta, whose enemies have been destroyed, and who protects feudatory kings, conquers the enemies." See his *Gupta Gold Coins in the Bayana Hoard* (Bombay, 1954), pp. cvi and cix (where the legend is misprinted), pp. 294–95 and 301–2. The same reading was given by Altekar in his *Coinage of the Gupta Empire* (Varanasi, 1957), pp. 194–97.

Later, in *Gupta Gold Coins in Bharat Kala Bhavan* (Bharat Kala Bhavan, 1981), P. L. Gupta and S. Srivastava republished two coins of this type from the Bayana hoard and added a new specimen. They used Altekar's reading, although—without giving their reasoning—they regarded it as "tentative" (pp. 21 and 73).

Although he did not advance the decipherment of the legend, B. Ch. Chhabra in his *Catalogue of the Gupta Gold Coins of the Bayana Hoard in the National Museum* (New Delhi, 1986) perceived a defect in Altekar's transcription: it is one *mātrā* short in the latter half of the line (p. xxxiii). Beyond this observation he did not proceed.[3]

S. R. Goyal makes no mention of Chhabra's critique in his recently published *Introduction to Gupta Numismatics* (Jodhpur, 1994), pp. 69–70, where he prints the line as in Altekar.

If one scrutinizes the plates in the aforementioned works, virtually all of the elements of Altekar's reconstruction can be discerned, but not with equal clarity. In particular, the first two *akṣaras* of the last word, *ripūn*, never seem to bear more than a passing resemblance to the Brāhmī writing that Altekar assumed. Since *ripūn* occurs in the area where Chhabra spotted a metrical problem, it behooves us to examine the word further, in the hope that here may lie a clue for successful decipherment of the line.

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[3] I should here signal a serious error. On p. xxxii, Chhabra omitted *rājatrātā* when he made his transcription of the elephant-rider type illustrated on pl. 30,9, and he proceeded to connect the resultant *kṣataripu-Kumāragupto jayati ripūn* with the reverse legend, *śrī-Mahendragajaḥ*, in order to produce an Upagīti line. The plate, however, clearly shows *rājatrātā* and thereby invalidates Chhabra's reading.

That the word may in fact not be *ripūn* emerges from perusal of a recent publication. Coin 90 in B. N. Muherjee's catalogue entitled *The Indian Gold, An Introduction to the Cabinet of Gold Coins in the Indian Museum* (Calcutta, 1990) is Allan's specimen of the elephant-rider type, here reproduced not only in a fine color plate at the end of the catalogue but also photographically enlarged on the front dust-jacket. The coins now available for study allow us to improve upon Allan's reading. Although somewhat abraded and partly off the flan, the legend clearly begins with *kṣataripu*[, has]*gupto*[under the elephant, and terminates with *jayati*[4] followed by the contours of what I should interpret not as *ripūn*, but as its synonym *śatrūn*. The epigraphy is typical of the kind of decayed Brāhmī displayed on many of Kumāragupta's emissions. The first *akṣara* clearly has its right vertical longer than its left, characteristic of *śa*[5]; next we see what appears to be 𐀀 , but the engraver may have carelessly simplified the *akṣara* from the expected *trū* (𐀀). The writing is stylistically not dissimilar to the last part of *jitaśatru* "whose foes have been conquered" in the Aśvamedha type of the same emperor illustrated in Altekar's *Bayana Hoard* on pl. 30, 9 (= chhabra, pl. 30, 7), 𐀀 𐀀 ; this word, incidentally, also provides a precise parallel for the juncture of *jayati* with *śatrūn*.

If we read *śatrūn*, the line is metrically correct:

kṣataripu-Kumāragupto   rājatrātā jayati śatrūn.
ᴜ ᴜ ᴜ ᴜ | ᴜ − ᴜ|− − || − − | − − | ᴜ|ᴜ ᴜ − | −

"Kumāragupta, whose enemies have been destroyed, protector of (feudatory) kings, conquers the foes."

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[4] Here and in the preceding two words, the strokes marking vowels other than /a/ are off the flan.

[5] See Altekar, *Gupta Empire*, p. 304.

[6] The terminal *-n* on this specimen is clearly not reduced in size, as it is on the coins on which Altekar based his reading (see his *Gupta Empire*, p. 305, with n. 12 [where "Pl. XXIII.40" should be read instead of "Pl. XXII.35"]).

It is worth nothing that with *śatrūn* the line exhibits a quasi-chiastic symmetry in which every word-element in the first part of the verse finds a semantically similar element in the second:

kṣata-ripu=kumāra-gupto[7] || rāja-trātā jayati śatrūn.

The balance of *kumāra-gupta* with *rāja-trātṛ* ("prince-guarded": "king-protector") may be more precise: the latter could also be an appositional possessive compound, "having king as protector," and as such could gloss *kumāra-gupta*. For examples of this type of formation see J. Wackernagel, *Altindische Grammatik*[2] 2.1 (Göttingen, 1957), §108b (pp. 274–75), and cf. e.g. *vīra-nātha* "having hero as protector" with *nāka-nātha* "sky-protector" (see Böhtlingk-Roth, *Sanskrit-Wörterbuch* 4.88 and 6.1299). Note also *rāyas-poṣa-* meaning both "Reichtum mehrend" and "Reichtumsmehrung" (Wackernagel, §112d Anm. [p. 291]) as well as *su-bhrātṛ* "excellent brother" and "having an excellent brother" (Böhtlingk-Roth 7.1093 and Böhtlingk on Pāṇini 5.4.157).[8]

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[7] Literally, "prince-guarded"; here *kumāra* also functions as the name of the god of war, see Böhtlingk-Roth, *Sanskrit-Wörterbuch* 2.337.

[8] Classical grammar requires suffixation of *-ka* in the transformation of a tatpuruṣa *rājā-trātṛ* into a bahuvrīhi (Pāṇini 5.4.153). But since personal names are exempt from this rule (5.4.155), as a bahuvrīhi, *rājā-trātṛ* could lack *-ka* because, like *kumāra-gupta*, it was to be taken as a name.

THE USE OF RELIGIO-POLITICAL PROPAGANDA
ON THE COINAGE OF XUSRŌ II

(PLATE 1)   TOURAJ DARYAEE

Coins are not only sources of information for economic history, but they also can be used in studying state propaganda. They constituted a major portion of the artistic product of the Sāsānian empire, A.D. 224–651, and were the most readily known and widely distributed objects produced by the state. The centralized state carefully controlled the mints and what was to be struck on the coins. Coins, along with certain other Sāsānian monuments, appear to have been an important means for defining and presenting the image of the dynasty. Although the artistic quality of the coinage declined as time went by and its aesthetic value may have been compromised to a certain extent,[1] they were still important tools of legitimacy and propaganda. In the early seventh century, there is a reclamation of

this aesthetic value not only for the usual silver drahms, but also the special issue coinages.

This is most apparent during the reign of Xusrō II (A.D. 590–628) who made three iconographic coinage reforms. His career as a monarch, as the last great Sāsānian ruler, was one of the most eventful of the Sāsānian dynasty, for he faced both internal opposition and long and depleting wars against Byzantium. From the outset, he was challenged by the mutiny of Wahrām VI. This he was able to suppress in 591, thus taking control of the entire Sāsānian empire. Having defeated his opponent, Xusrō II once again crowned himself and began reforming his coinage. The silver coinage of Xusrō II, the drahm, can divided into three periods based on its typology.[2] While the types have been known, the reason for the coinage reform of Xusrō II has received little attention. This paper will demonstrate that the motives of the coinage reform were directly linked to the political and religious aspirations of this monarch.

During Xusrō's first year, there was a civil war between him and his general Wahrām VI of the Mehrān family. Xusrō II was pushed out of his empire and took refuge in Byzantium, at Hierapolis, waiting for assistance from the emperor Maurice.[3] In the same year, he was able to come back and defeat Wahrām VI, who fled to the east and was eventually assassinated by the Turks.[4] It is thought by some modern authors that since Wahrām VI was not from the family of Sāsān, he would never have been able to rule Iran. Although this may carry some modern value judgments, on the whole this argument reflects Sāsānian imperial ideology.[5] As for Wahrām VI's own position, his

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[2] R. Göbl, *Sasanian Numismatics* (Braunschweig: Linkhardt & Biermann, 1971) plate XII; the three types are type I/1, I/2, and II/3. For the Avestan transcription, I have followed Karl Hoffmann's system, "Avestan Language," *Encyclopaedia Iranica* 3, 1989, pp. 47–62.; for Middle Iranian, I have followed D. N. MacKenzie's system of transcription, *A Concise Pahlavi Dictionary*, Oxford University Press, London, p. 1990.

[3] Chronicon Paschale (Liverpool: Liverpool University Press, 1989), p. 140.

[4] A. Christensen, *L'Iran sous les sassanides* (Copenhagen, 1936), p. 439.

[5] F. D. J. Paruck, *Sāsānian Coins* (New Delhi: Indological Book Corporation, rpt. 1976), p. 111; R. N. Frye, *The History of Ancient Iran* (Munich: C. H. Becksche Verlagsbuchhandlung, 1983), p. 355.

issue of coins in his name shows he regarded himself as the legitimate king of (Middle Persian) *Ērān-šahr*, "Land of Iranians."

Xusrō II, Gbl I/1, 590

In his first year, Xusrō II wears the merlon crown of his father. The practice of wearing the crown of the previous sovereign is not unprecedented; it goes back to the third century, when Šābūhr I wore his father Ardaxšīr I's crown as his coronation crown to legitimize his rule.[6] The flan of Xusrō's type I/1 is thick and less round than the latter types of his coinage. The quality and craftsmanship are cruder than the previous coinage of Sāsānian monarchs. This may be due to the civil war 590–91, because this crudeness is not seen before or after type I/1. A double ring encircles the bust, something new. The moon symbols surround the obverse, like the coinage of Xusrō's father Hormizd IV. On the reverse, a triple ring circles the fire altar and its guardians and four moons are added. These appear on all subsequent Sāsānian coins along with other new features.[7]

Xusrō II, Gbl II/2 591–600

In the second year of his reign, there are major changes on the coins of Xusrō II. He wears a new winged crown symbolizing (Avestan Vərəθraγna / Verethragna, (Middle Persian) *Wahrām*, (Persian) *Bahrām*. The quality of the coin is improved and the flan is flatter and rounder. The legend GDH *xwarrah* is added on the obverse.[8] On the reverse suns are also added to the moons at the cardinal points

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[6] A. D. H. Bivar, "A Sasanian Persian Seal-Matrix of Yazdgird I (A.D. 399–420)," *Israel Numismatic Journal*, vol. 11, 1990–91, p. 91. I would like to thank Dr. Prudence O. Harper for bringing this article to my attention when I was in New York.

[7] Only Kawād II and Ardaxšīr III are exceptions to this rule. This may have been the result of a reaction to Xusrō II's rule where his heirs wanted to portray themselves as the Sāsānian rulers before him, thus going back to the older design.

[8] J. Harmatta, "La médaille de jeb Šāhānšāh," *Studia Iranica*, vol. 11 (Paris, 1982), p. 171.

of the coin surface. This becomes the norm for all subsequent Sāsānian rulers.[9]

Xursrō II, Gbl II/3, 601–28

The quality of this coinage type is even better than the type II/2. The iconography is much clearer and the flan is larger and flatter. On the obverse an interesting development takes place. There is a break in the inner ring at the top left, with the legend extending into the break. This has been explained as a result of the larger bust of this type, which does not leave enough space to fit everything within the rings. On the reverse, the headgear of the altar attendants changes from a round cap to a crescent shape. The iconography of type II/2 is a response to the claims of Wahrām VI and reflects Xusrō's legitimist arguments. Once he was restored to power and able to do so, Xusrō II asserted his legitimacy through the artistic design on coins as well as in the religious dogmas of Zoroastrianism.

Xwarrah

As mentioned, type II/2 has a new legend which differs from type I/1. The legend reads: *ḥwslwb GDH 'bzwt'*, the glory of Xusrō increased. The appearance of the ideogram GDH on Xusrō II's coinage merits some discussion. While GDH *xwarrah* is already present in the Parthian period, appearing on wine-vessels, it appears for the first time on the coinage in 591. It is surprising that it did not appear on the coinage previously, as *warrah* is the central concept of the rightful rule in ancient Iran, especially during the Sāsānian period. The Sāsānians created a historiography which placed them in the line of rightful rulers of Iran, the Pēšdādiāns, Kayāniāns, and then themselves, ignoring the Achaemenians to a large extent.[10] The Kayāniāns were

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[9] There are some limited number of Hormizd IV's coins with the legend *xwarrah*, see M. I. Mochiri, *Etude de numismatique iranienne sous les sassanides et arabe-sassanides*, vol. 2 (Leiden: E. J. Brill, 1983), p. 129.

[10] Gnoli believes the absence of *farnah-* in Old Persian inscriptions indicates it had no role in the Achaemenian regal ideology, G. Gnoli, "Politique religieuse et conception de la royauté sous les achéménides," *Acta Iranica Commémoration Cyrus*

mythical kings who, according to the Avesta, ruled Iran, and the Sāsā-
nians in their genealogy connected themselves to them to claim sover-
eignty to Iran. By this process the national history emerged as a sort
of Kayāniăn or Zoroastrian sacred historiography.[11]

The title *Kay* was used by the Sāsānians for the first time under
Šābūhr II (309–79).[12] Under Yazdgird II (439–57) the title appears on
the coins. It is from Yazdgird's reign that Sāsānian kings began using
this title on the coins regularly,[13] and the obverse of his coins reads:
mzdysn bg' kd' yzdkrt', the Mazda worshipping god Kay Yazdgird. This
shows an important change in the ideology of the Sāsānians and their
institutionalization of Kayānian legends and Sāsānian Zoroastria-
nism.[14] The Kayānian names and legends have become a main compo-
nent of Sāsānian ideology.

In the myths, *xwarrah* accompanied the rulers of Iran so long as the
rulers abided by the laws of the Zoroastrian religion. If the *xwarrah*
would depart from him, he would lose his sovereignty. As an example
from the Avesta, there is the story of (Avestan) *yima xšaēta* "Splendid
Yima," (Middle Persian) *Jam*, (New Persian) *Jamšīd*. In the Avesta
(Yt.XIX.35), the *xwarrah* leaves Yima in the form of a bird:

paoirīm x^varənō apanəmata
x^varənō yimaṯ hača xšaētāṯ
šusaṯ x^varənō yimaṯ haca vīuuaŋhušāṯ
mərəɣahe kəhrpa vārəɣnahe

The first time *xwarrah* fled away,
the *xwarrah*, from the splendid Yima,

(Leiden: E. J. Brill, 1974), pp. 170–71; G. Gnoli, "On Old Persian Farnah-," *Acta
Iranica* 30, Iranica Varia: Papers in Honor of Professor Ehsan Yarshater (Leiden:
E. J. Brill, 1990), p. 84.

[11] T. Daryaee, "National History or Keyanid History? The Nature of Sassanid
Zoroastrian Historiography," *The Journal of the Society for Iranian Studies*, vol. 28,
3–4 (1995), pp. 129–42.

[12] Frye (above, n. 5), p. 320.

[13] Paruck (above, n. 5), p. 366; Göbl (above, n. 2), table XV for Yazdgird, Pērōz,
Valāxš.

[14] Daryaee (above, n. 11), p. 136.

the *xwarrah* hastened away from Yima, the son of Vīvahvant
in the shape of the bird varegna.

When Yima lost his *xwarrah*, he also lost his sovereignty and the
evil Aži Dahāka was able to defeat him. In the Avesta, the reason
xwarrah left Yima is that he accepted false speech, *draōgəm vāčim*
and untrue thought *aŋhaiθīm cinmāne*. Thus, *xwarrah* is a pre-requisite
for ruling in the Iranian world—without it ruling is impossible. In the
Avesta, this *xwarrah* belongs to the Aryan countries *airriianąm*
dax̌iiunąm[15] as well as the Kayānians,[16] but it is especially connected
with Kay Xusrō (Avestan *kauui Haosrauuah*), because of his victo-
riousness *vərəθraɣnahe*, his conquering superiority *vanaiṇtiiăsca pait*
uparatātō, and his immediate victory over enemies *haθrauuataheca*
paiti hamərəθanąm.[17]

The etymology of *xwarrah* is central for the question of iconography
on Sāsānian numismatics, especially that of Xusrō II.[18] The most
common accepted etymology has been to derive the word from pIE
*swel-n-o-s "solar essence." According to this interpretation *xwarrah* is

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[15] K. F. Geldner, *Avesta, the Sacred Books of the Parsis*, 3 vols (Stuttgart, 1886–96) Yašt XIX.60.

[16] Yašt XIX.71.

[17] Yašt XIX.74.

[18] Several alternatives have been suggested for the word. The first suggestion was offerd by Bailey who derived the word from pIE *suel Av. *x̌ᵛar* meaning "to swallow," in the Avesta "to eat," see Harold W. Bailey, *Zoroastrian Problems in the Ninth-Century Books*, Ratanbai Katrak Lectures (Oxford, 1971), pp. 1–77, while E. Pirart, "L'origine avestique des dynasties mystiques d'Iran," *Kayān YASN* (Barcelona: Editorial AUSA, 1992), p. 6, does not commit himself to any etymology. See also A. Hintze, *Der Zamyād-Yašt*, edition Übersetzung, Kommentar (Wiesbaden: Dr. Ludwig Reichert Verlag, 1994), pp. 15–17. In modern Persian it appears in such phrases as *dast na xordah* "not touched" or *sūd xordan* "to take usury," Hintze, pp. 28–33. Bailey believed that the connection of *xwarrah* with light and luminosity was secondary and thought that many have been misled. The second suggestion has been to take the word from pIE *suel, meaning to "smolder or glow without burning," Hintze, p. 32. The third alternative is to posit an Iranian verb huuar-"sto shine," Malandra, *An Introduction to Ancient Iranian Religion* (Minnesota, 1983), p. 89.

in fact visible as a glorious nimbus or a halo that surrounds the king.[19] I suggest the double ring around the bust of Xusrō II indicates this idea of fiery *xwarrah* or the halo,[20] as well as serving to define background and foreground, which causes a sense of depth and dimensionality.[21] The break in the inner ring for type II/3 may suggest a further

[19] B. Lincoln, *Priests, Warriors, and Cattle, a Study in the Ecology of Religions* (Berkeley: University of Californa Press), p. 79. S. Greppin, "xᵛaɾənah as a Transfunctional Figure," *Journal of Indo-European Studies* 1, 2 (1973), pp. 232–42, contests Bailey's suggestion with the Armenian and Iranian evidence and confirms Duchesne-Guillemin's theory to mean the sun, "Le Xᵛarənah," *Annali dell'Istituto Orientale di Napoli*, Sezione Linguistica 5 (1963), pp. 19–31, and *Symbols and Values in Zoroastrianism. Their Survival and Renewal* (New York: Haper and Row, 1966), pp. 140–46. In Indo-Iranian languages these forms can be found: Old Iranian **huuar-*, Old Indic *súar-*, Sanskrit *svár-*, Avestan *xwarrah*, Median *farnah*, Old Persian *farnah*, Middle Persian *xwarrah*, Manichaen Middle Persian *prh*, Khotanese *phārra*, Sogdian *prn*, Kushan-Bacterian φαρ(ρ)ο, Choresmian *xwar(a)*, Scythian φαρνα, Ossetic *farn*, Persian *farr* or *xorra*; for the reconstructed form see R. Schmitt, "Andere Altiranische Dialekte," in *Compendium Linguarum Iranicarum* (Wiesbaden: Dr. Ludwig Reichert Verlag, 1989), p. 89; for the Old Indic see C. R. Lanman, *Sanskrit Reader* (Boston: Ginn, Heath & Company, 1884), p. 283; for the Old Persian, Kušano-Bactrian, Scythian, and Ossetic forms, see Wilhelm Brandenstein and Manfred Mayrhofer, *Handbuch des Altpersischen*, (Wiesbaden: Otto Harrassowitz, 1964), p. 118; for the Choresmian, see H. Humbach, "Choresmian," in *Compendium Linguarum Iranicarum* (Wiesbaden: Dr. Ludwig Reichert Verlag, 1989), p. 195. Yt.X.127 discusses the connection of *Mithra* and the form and position of *xwarrah* which confirms the form given to this abstract idea of the Indo-Europeans:

> nixšata ahmāt vazaṯa
> ātarš yō upa. suxtō
> uɣrəm yō kauuaēm xᵛarənō
> In front of him (Mithra) flies
> the blazing Fire which is
> the strong Kayānian *xwarrah*.

For a translation, see I. Gershevitch, *The Avestan Hymn to Mithra*, (Cambridge: the University Press, 1959), p. 137; G. Gnoli, "Note Sullo Xᵛarənah-," *Acta Iranica* 23, "Orientalia J. Duchesne-Guillemin Emerito Oblata" (Leiden: E. J. Brill, 1984), p. 211.

[20] One may see similar reflection on the Kushan coin with the legend ΦΑΡΡΟ, where a ring encircles the figures head, see S. Shahbazi, "An Achaemenid Symbol, II. FARNAH >>(God Given)<< Fortune Symbolized," *Archaeologische Mitteilungen aus Iran* (Berlin: Verlag von Dietrich Reimer, 1980), vol. 13, p. 133.

[21] B. Badiyi, "Representation Techniques in Sassanian Coinage," *Classical Numismatics Malter* 55, 7 Nov. 1993, appendix p. 1.

increase in his *xwarrah*, by putting the legend and its iconographic form together. This was perhaps done because he was able to defeat the last internal obstacle to his reign, Wīstahm.

There is importnat Sāsānian evidence for what they thought this *xwarrah* should look like. In the *Kārnāmag ī Ardaxsīr Pāpakān* (Book of the Deeds of Ardaxšīr) (Karnāmag 148.8.11–12), a legendary work on the beginning of the Sāsānian dynasty and its founder written at the end of the Sāsānian period,[22] we can see that *xwarrah* is connected with the sun, and thus the theory of the halo which appears around the king on the coins is confirmed. In this episode, Pāpak dreams one night that the Sāsānian family is blessed with the *xwarrah*:

pāpak šab-ē pad xwamn dīd čīyōn ka xwaršēd
az sar ī sāsān be tāft und hamāg gēhān rōšnīh grift

One night Pāpak saw in a dream that the sun was shining
from the head of Sāsān; and all of the material world became
bright.[23]

Other Middle Persian texts confirm that *xwarrah* was thought to take the form of fire and its connection with luminosity. In the *Bundahiš* the Sāsānian sacred fires were thought of as three luminous objects which were compared to *xwarrah* (BTD1 102.4–7):

ēn sē ātaxš ast ādūr farrobag ud gūšnasb ud
burzinmihr az bundahiš ohrmazd čīyōn sē xwarrah
oyšān pad pāsbānīh ī gēhān frāz brēhīnēd

These three fires are Adūr-Farrōbāg and (Adūr-)Gušnasp

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[22] M. Boyce, "Middle Persian Literature," *Handbuch der Orientalistik*, Iranistik, I, IV, 2 (Leiden: E. J. Brill, 1968), p. 60.

[23] An echo of this concept appears in the classical Persian literature, *Bahman-Nāme*, ed. R. Afifi (Tehran: Scientific & Cultural Publications Company, 1991), preface (155):

ke xōršēd az ō sar farāzad hamī
bozorgī ze nāmaš be-nāzad hamī
That the sun arises from him
he feigns distain from the largess of his name."
One can notice the wordplay sar farāzad "rises from the head."

and (Adūr-)Burzēnmihr, Ohrmazd in the beginning like three
xwarrah created them for the guardianship of the material world.

In the realm of Sāsānian numismatics it is significant that Xusrō II
is the first emperor to inscribe the word *xwarrah* on his coins. We do
not know why the word for such an important concept does not
appear on the coins until at the end of the Sāsānian period. It can be
surmised that the word would not have been used if the concept
behind the word was not already well known by the people. Neverthe-
less, the inscription of the word after his coinage reform must have had
a specific purpose.

One cannot emphasize enough the important connection between
the Kayānians, especially Kay Xusrō and *xwarrah*. Thus it should not
be surprising that Xusrō II was the one who used these concepts to
further legitimize himself. It is not unknown in late antiquity to
portray the king and his opponent as the hero and villain depicted in
the holy texts. The contemporary events and struggles took on a reli-
gious coloring. Xusrō II employed the Zoroastrian religio-political ideas
of soveregnity when battling Wahrām VI, portryaing himself as the
possessor of religious authority and rightful rulership, i.e, the
xwarrah.[24]

The Deity Wahrām

The deity Wahrām was still important in the Parthian period. He is
mentioned by Antiochus of Commagene at Nemrud Dagh in 60 B.C.
Confirming the continuous remembrance of this cult is the appearance
of a bilingual inscription on a statue of Hēraklēs found in Seleuciam
where Wahrām is equated with Hēraklēs, **HPAKΛEOYC** = *wrtrgn*.[25]

[24] For a discussion of *xwarrah* and kingship see G. Widengren, "The Sacral
Kingship of Iran," *The Sacral Kingship*, Contributions to the Central Theme of the
VIIIth International Congress for the History of Religions (Rome, April 1955)
(Leiden: E. J. Brill, 1959), p. 246; R. N. Frye, "The Charisma of Kingship in ancient
Iran," *Iranica Antiqua* 6 (1964), pp. 36–40; J. K. Choksy, "Sacral Kingship in Sasa-
nian Iran," *Bulletin of the Asia Institute*, n.s. 2 (1988), pp. 35–52, especially p. 37.

[25] E. Morano, "Contributi All'interpretazione Della Bilingue Greco-Partica
Dell'eacle Di Seleucia," in *Proceedings of the First European Conference of Iranian*

The existence of Parthian theophoric names such as *wrtrgngwnk*, *wrtrgnssn*, and *wahragnsasan* also confirms the importance of the cult. In the Sāsānian period the continued importance of the deity is also confirmed by personal names found on inscriptions, *wrhr'n* and *wrhr'nkn*.[26] In the later Sāsānian period this name also appears on personal seals as an element of names *whl'mgwśnsp* and *wḥl'm'n*.[27] Of course, there were also five king of kings with this name, Wahrām I (273–76), II (276–93), III (293), IV (388–99), and V (421–39).

It has also been suggested that the existence of falcon amulets demonstrates the importance which Wahrām had among the warrior class.[28] This deity smashes all resistance through offensive warfare and bestows victory. Wahrām also has a close relationship with *xwarrah*.[29] In the Avesta he has the epithet *barat* $x^v ar\partial n\bar{o}$, he bore *xwarrah*,[30] and in a gloss in the *Pahlavi Wīdēwdād* he is called the standard bearer of the *xwarrah* (PW XIX.37):

> be xwānom pērōzgar ohrmazd-dād
> (Wahrām Yazd) (kē) bared xwarrah
> [ī] ohrmazd-dād (drafś)
>
> I call upon the victorious Ahura-created
> deity, Wahrām who bears the banner
> of the Ahura-created *xwarrah*

There is ample evidence to reveal the connection between the two concepts.[31] The deity Wahrām is the granter of success in battle only

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Studies, eds. G. Gnoli and A. Panaino (Rome: Istituto Italiano Per Il Medio Ed Estremo Oriente, 1990), p. 231.

[26] M. Back, *Die Sassanidischen Staatsinschriften*, Studien zur Orthographie und Phonologie des Mittelpersischen der Inschriften zusammen mit einem etymologischen Index des Mittelpersischen Wortgutes und einem Textcorpus der behandelten Inschriften, *Acta Iranica* 18, (Leiden: E. J. Brill, 1978), p. 270.

[27] P. Gignoux and R. Gyselen, *Bulles et sceaux sassanides de diverses collections*, Studia Iranica 4 (Paris: Association pour l'avancement de études iraniennes, 1987), seals MFT 47a and MFT 63a.

[28] Malandra (above, n. 18), p. 82.

[29] J. Duchesne-Guillemin (above, n. 19), p. 124.

[30] Yaśt XIV.2; Malandara (above, n. 18), p. 82.

[31] *Zand-ī Khūrtak Avistāk*, ed. Ervand B. N. Dhabhār, Pahlavi Text Series 5

to the righteous, and the false ones are crushed by him.[32] The coinage of Xusrō II precisely presents this scheme. Xusrō II's year two, crown with wings is a symbol of Wahrām (personification of victory) one of whose avatars is the falcon.[33] The combination of crown and the word *xwarrah* connects both the deity Wahrām and righteousness to Xusrō II.[34] Wahrām possesses the *xwarrah* more than anyone, (Yt.XIV.3) x^v*arənaŋha ahmi* x^v*arənaŋuhastəmō* "In (having) *xwarrah* I am most in possession of *xwarrah*." This *wahrām* symbol which bestows victory was taken by Xusrō II when he defeated the earthly Wahrām VI, who would become the false one in this scheme, thus further showing the significance of the Avestan ideas in seventh century Iran. By inscribing *xwarrah* on his coins, Xusrō II reinforced the Sāsānian assertion that they were the only rightful possessors of the *xwarrah* and so, where the legitimate rulers of Ērān-šahr. The conjunction of the two concepts, i.e, *xwarrah* and *wahrām* on the coins of Xusrō II was inscribed purposefully, not merely as an iconographic reform based on mere artistic desire.

The concept of *xwarrah* was well known by the Sāsānians. It was they themselves who by using ideas from the Avesta, their holy texts, propagated the use of *xwarrah* as the symbol of rightful rule. The

(Bombay: 1978), p. 248; H. Mahamedi, "propitiation to the Thirty Deities of Zoroastrianism" (Ph. D. diss., Harvard University, 1971). I thank Dr. Mahamedi for giving me a copy of his work. In *Stāyisn sī rōzag*, another Zoroastrian Middle Persian text, it is also stressed that Wahrām is a standard bearer (Mahamedi, 1971):

> wahrām (ī) pērōzgar (ī) drafšdār (ī)
> pērōzgar (ī) gēhān dāštār ī purr-pērōzgar ī
> dušmanān deēwān wattarān zadār
> The victorious Wahrām, the possessor of the banner
> of victory, the maintainer of the Material world, the full
> triumphant over the enemies, the smiter of demons and evils.

[32] M. Boyce, *A History of Zoroastrianism. The Early Period* (Leiden: E. J. Brill, 1989), p. 63.

[33] Yašt XIX.35. The word is a compound vrtra- "resistance" and the verb *√ghan- "to strike, smite, smash, kill" thus meaning the smasher of resistance.

[34] In Yašt XIV the ten different avatars of Wahrām are given, and they are the wind *vāta*; a bull, *gəus*; a stallion, *aspa*; a camel, *uštra*; a boar, *varāza*; a youth, *narš*; a falcon, *vārəγna*; a wild ram, *maēša*; a goat, *būza*; and a warrior, *vīra*.

winged crown representing *Wahrām* also had already appeared in the early Sāsānian period.

According to Göbl, a Sāsānian king went thhrough a second corona-tion and changed crowns when his authority was challenged. Each Sāsānian king had to take a new crown when his *xwarrah* was inter-rupted, and this could have happened when an usurper like Wahrām VI crowned himself and challenged Xusrō II's rule.[35] Xusrō's new crown symbolized his victory over Wahrām VI and his and his family's legitimate authority over the realm of *Ērān-šahr*. Xusrō II used the coinage to emsphasize that only the ruler ordained by the gods holds this kayānian glory. This *xwarrah* was conferred by the gods to the legitimate ruler, and so if this glory was taken or interrupted by an usurper, it was the duty of the rightful king to take it back, so that the rightful king would rule.[36]

The Sāsānian monarch claimed to be from the lineage of deities *čihr az yazdān*,[37] and received his rule from by the sanction of the deities. Since the monarch possessed the *xwarrah*, he was the rightful ruler of *Ērān-šahr*, as the Kayānians had been in the mythical past. The

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[35] Göbl (above, n. 2), p. 10–11.

[36] The Paikuli inscription gives us the best contemporary evidence regarding the aspirations of Narseh and the position of *xwarrah*:

> W GDE W štry W NPŠE ALŠA
> W pthšly ZY nyd'k'n MN yzd'n MKBL WN MN
> SLYA kly ZY yzd'n W ANŠWTA

> And the glory and the realm and his (Narrseh) own throne and
> honor which (his) ancestors received from the gods,
> may (He) take (them) back from the evildoers against
> gods and men.

For the translation see P. O. Skjærvø, *The Sassanian Inscription of Paikuli* 3.1, restored text and translation (Wiesbaden: Dr. Ludwig Reichert Verlag, 1983), 8 B11, 03 – 9 B2, 04, pp. 34–35; see also 43 H3, 03 – 43 H8, 02, p. 69.

[37] Not only do the Sāsānian inscriptions present this scheme, but it is also on the coinage of early Sāsānian kings beginning with Ardaxšīr I. For the occurrence on the inscriptions see ANRm-a 02–03, ŠNRb 02, ŠKZ Parth. 01, ŠH & Parth. ŠTBq 02, ŠVŠ 05–06, NVŠ, ŠTBn-I, ŠTBn-II 05, ŠPs-I 02, in Back (above, n. 26), pp. 281–498; this formula appears on the Persis coins starting with Bagadat, and the legend reads bgdt prtrk' zy 'lhy', D. Selwood, "Minor States in Southern Iran," *The Cambridge History of Iran* 3.1 (Cambridge: Cambridge University Press), p. 300.

contemporary religio-political justifications of this reality manifested themselves on the coinage of Xusrō II. The concept of *xwarrah* as a legend and the halo as its ideal manifestation appear under Xusrō II. His new crown on year two coins pictured *wahrām* as its ideal form, the wings of a bird of prey. These two concepts were interrelated and Xusrō II used them as propaganda symbols on his coinage, reflecting the beliefs of this monarch during his defeat of his opponent.[38]

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[38] The second coinage reform of Xusrō II appears in year 11 of his reign (601). After defeating Wahrām VI, he had to face another contender, Wistahm. According to Paruck (above, n. 5), p. 234, the last coin minted in his name was for year 10 (600) at RD, Rayy. Thus it appears that a second reform was done after the defeat of Wīstahm.

A GENERATION OF NUMISMATIC CO-OPERATION: FINDINGS ON THE NOTES AND COINS OF THE CONFEDERATION THROUGH THE PAPERS OF ROBERT MORRIS

(PLATES 2–5)   ELIZABETH M. NUXOLL

Newspapers proclaimed in 1825 as the nation prepared to celebrate the 50th anniversary of its independence "that the management of the national Treasury, in any period since the adoption of the Federal Constitution may be compared with piloting a ship down a broad river free from shoals while that of the Revolution was similar to conducting a crazy vessel, without helm, canvas, rigging, or compass

This paper, first presented at the American Numismatic Society in April 1996, and revised to answer questions raised during discussion, is derived from research conducted for The Papers of Robert Morris at Queens College of the City University of New York, and reflects the efforts of all the staff members. The project is supported by grants from the National Endowment for the Humanities and the National Historical Publications and Records Commission, and by matching funds from various private foundations, organizations, and individual contributors, among which is the American Numismatic Society. Citations to the published volumes are from E. James Ferguson, John Catanzariti et al., eds., *The Papers of Robert Morris, 1781-1784* (Pittsburgh, 1973-), 8 volumes published to date, a ninth will appear soon. For previous summaries of the project's numismatic findings, see "Robert Morris Papers Examine Early Coinage," *Coin World*, March 29, 1989; and "Revolutionary Finances," *The Asylum* 7, 2 (Summer, 1989), pp. 7-11.

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across the ocean to a port never before reached by the navigator. But for this duty, Mr. [Robert] Morris's habit of steady application to business and fertility of expedients qualified him and he safely lead the barque of finance into the untried port of safety." And yet today, few people know who Robert Morris was, much less that he headed the treasury of the United States. It is part of the mission of the Papers of Robert Morris, a historical editing project at Queens College of the City University of New York, to bring Morris's role and his contributions to our history back to public attention.

Morris is usually referred to as the "Financier of the American Revolution," as according to myth he personally financed or subsidized the American Revolution. This perception is not entirely true. Morris did put his credit behind the fledgling national government, and often his money, but he also benefitted from the various economic opportunities that working for the government provided, so that the benefits were generally reciprocal. The title "Financier" is actually a shorthand expression for his position of Superintendent of Finance of the United States for the period from 1781 to 1784.[1]

Morris was a Philadelphia merchant who rose to political prominence though service on important state and Continental congressional committees that managed public affairs during the early years of the

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[1] For an overview of Morris's administration, see Clarence L. Ver Steeg, *Robert Morris, Revolutionary Financier, with an Analysis of his Earlier Career* (Philadelphia, 1954); and E. James Ferguson, *The Power of the Purse: A History of American Public Finance, 1776-1790* (Chapel Hill, N.C., 1961). For general biographies of Morris, see Ellis Paxson Oberholtzer, *Robert Morris, Patriot and Financier* (New York, 1894; rpt., New York, 1968); William Graham Sumner, *The Financier and the Finances of the American Revolution* (New York, 1892; rpt., New York, 1970); and Eleanor Young, *Forgotten Patriot: Robert Morris* (New York, 1950). For documents discussing U.S. monetary history prior to Morris's term of office, see Gouverneur Morris to Francisco Rendon (Spanish Agent in the United States), March 5, 1782, *Morris Papers* 4, pp. 352-58; and Benjamin Franklin, "On the Paper Money of the United States of America," in Albert Henry Smyth, ed., *The Writings of Benjamin Franklin* (New York, 1970; first published, 1907), pp. 231-36. Smyth had tentatively dated this document July 3, 1784, but based on its contents it was more probably written in late 1780. It will be printed under that date in vol. 34 (forthcoming) of Leonard W. Labaree, William B. Willcox, et al., eds., *The Papers of Benjamin Franklin* (New Haven).

Revolution. He came into executive office in 1781 as the result of two crises, one military, one financial. These crises had caused the United States temporarily to overcome opposition to centralized government enough to create executive departments to handle public business in place of the usual boards and committees.

In general there were two principles of accountability Americans favored at that time. The one which lead to Morris's appointment was what was later referred to as "the buck stops here" rule of accountability: put one person in charge who can be watched, then hold him accountable for the results. However, the more common approach to executive authority during the Revolution was the use of committees, commissions or boards, usually balanced politically and geographically. The members of the committee could then watch each other, and consensus had to be achieved. The public supposedly then could be reasonably sure that no one was in a position to abuse power. But the committee system was usually inefficient and when things went wrong it was difficult to assess who was responsible, much less to hold anyone accountable. In 1781, when Morris was called to office, the situation was dire enough to switch principles of accountability. For the first time executive departments were created with single heads. The Continental Congress chose Morris to head the Finance Department with the title, not of Secretary of the Treasury, as such a position would later be called, but of Superintendent of Finance.

The military problems to be faced were the occupation of New York City and vicinity and of much of the south by British forces and a military stalemate in which American ability to fight was limited by the drying up of resources. The financial problems were directly related to the collapse of the paper money used to finance the early war years. A major part of Morris's mission from the start was first to create new forms of money that could be used to sustain the war and then to preserve their value. Consequently, as editors of Morris's public papers, the staff of the Papers of Robert Morris soon confronted many questions related to money and had to develop a certain expertise in numismatic matters. None of us had such knowledge at the start. We came from traditional fields of history—we were primarily political, constitutional, or diplomatic historians. So we turned to numismatic experts for advice and developed a collaborative rela-

tionship which has now lasted for over twenty years and continues to bear fruit in surprising ways.

Our contact with the numismatic community goes back to the 1970s when one of our original editors, John Catanzariti, began conferring with John J. Ford, Jr., Eric P. Newman, and staffs of the National Archives and the Smithsonian Institution in order to obtain the information he needed to annotate texts related to Morris's plan for the creation of the mint and the production of an American coinage. Having then become acquainted with various issues in the field, John proposed that, instead of illustrating our volumes with portraits, we should depict the coins, notes, debt certificates, and other financial paper that were connected with Morris's administration. He sought to tie the texts to the material culture and to combine the information that numismatists and curators knew from their hands-on experience with notes, coins, and other relevant materials with what we were discovering through the documentary record. He began to implement this policy in volume 6, and thus launched a search for specimens of all the financial instruments mentioned in our texts. We have now reached volume 9, our last volume, and are tying together the findings we accumulated over a thirty year period. Volume 8 came out early in 1996, covering the period from May to December 1783. Volume 9 which will cover 1784, the last year of Morris's administration, is now in press. We plan to produce a cumulative index and also, if possible, an electronic edition that would permit people to search our data by computer.

Before turning to numismatic issues, I would like first to introduce you to the editorial cast of characters whose research led to the numismatic findings that appear in our volumes. Like most editions of long duration, we had a varying staff, but all of our activities were collaborative, and our findings reflect work by all our staff. Individual editors were sometimes given primary responsibility for certain topics, and I would like to give credit where it is due. Our founding editor, E. James Ferguson, was the foremost historian of early American public finance and gave the overall guidance to our edition. He was assisted from the beginning by John Catanzariti, who took command after Professor Ferguson was injured. Catanzariti served as chief editor for the Morris edition from 1980 to 1986, when he left to become the

editor of the Thomas Jefferson Papers at Princeton. Professor Ferguson provided the expertise which enable us to publish and annotate the original plans for a bank and mint. But it was John Catanzariti who first became directly involved with numismatics in the course of annotating texts on the mint and through his search for illustrations. It was Catanzariti who first corresponded in the early 1970s with Eric Newman who was updating his original edition of *The Early Paper Money of America*. This led to a collaborative search for more information on Morris's notes. In the late 1970s John met John J. Ford, Jr., who had just acquired a set of the coins produced under Morris's coinage plan. At the same time, as part of its activities related to the Bicentennial of the American Revolution, the National Archives was cataloging and microfilming many of its early Treasury records and Catanzariti collaborated with them in identifying various items connected to Morris's administration. It became possible to find notes and certificates previously unknown. When it came time to explain the coins produced by Robert Morris, Catanzariti assigned the preliminary research to David Mattern, now an editor of the James Madison Papers, but then a fellow at our project sponsored by the National Historical Publications and Records Commission. I was given the task of reviewing and checking the results of Mattern's search of the numismatic literature published to that point. That process sparked my interest in issues numismatic, for my knowledge of the texts and context made me question some speculative interpretations that had entered the literature and become established as fact, but for which there was little solid evidence. I had also been assigned preliminary research related to the creation and use of Morris's notes and to the Bank of North America and became particularly interested in those topics and their relationship with each other.

Consequently, in this article I would like to provide an overview of all three aspects of Morris's monetary contributions:

1. The plan for a mint and the production of the coins that came to be known as the "Nova Constellatio pattern coins."

2. The development of the Bank of North America and the production of the first bank notes of the United States.

3. The production and use of Morris's notes, illustrations of which are included.

THE PLAN FOR A MINT AND FOR PRODUCTION

Morris's proposal for a mint, first introduced in a letter to Congress in January 1782, was presented in volume four of our edition, while our findings regarding his production of the pattern coins Morris produced in 1783 were covered in volume seven.[2] Morris's plan was drafted primarily by his assistant Gouverneur Morris (no relation), but no doubt reflected the ideas of both men (Plate 2, 2). The plan was based on a mathematically complex monetary system which was criticized as excessively cumbersome and ultimately defeated by the chairman of the committee which took it up in 1784, Thomas Jefferson, whose proposed revisions which were ultimately adopted.

The Nova Constellatio pattern coins were the fruit of the original plan which had three significant aspects:

1. Emphasis on a silver rather than a gold standard;

2. Development of a decimal coinage system—the first decimal coinage system ever actually proposed (Thomas Jefferson had previously suggested a decimal coinage, but had not submitted any concrete plan); and

3. The complicated mathematical scheme designed around a new money unit that would make the new coins convertible with the various state coins and notes already in existence, which were usually based on local currency, the pound and subdivisions thereof.

It is the third aspect of the plan that requires the most explanation. Like the state governments, American merchants kept their books in state currencies, which varied in value. None of their account books were kept in dollars despite the fact that the United States had been issuing paper money in values based on the Spanish dollar since 1775. On the other hand, the accounts of the Continental government were kept in dollars, divided into 90ths to facilitate conversions from the

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[2] On Morris's plans for a mint and coinage, see *Morris Papers* 1, p. 304, 4, pp. 25-40, 7, pp. 737-43; Worthington C. Ford et al., eds., *Journals of the Continental Congress, 1774-1789* (Washington, D.C., 1904-37), 22, pp. 86-87, 24, p. 273; and Julian Boyd et al., eds., *The Papers of Thomas Jefferson* (Princeton, N.J., 1950-), 7. The plan for the mint was also published with accompanying notes in *Coin World* on August 24, 1983.

Pennsylvania currency in which many expenditures were actually made (1/90th of a dollar was equivalent to one pence in the currency of Pennsylvania and several of the surrounding states).[3]

In order to appease the states and make it easier to convert the monetary system, Morris's initial plan was based on a new monetary unit (called a mill) that was 1/4 of a grain of silver and equivalent to 1/1440 of a Spanish dollar. The idea for the mill seems to have been a variation on some calculations included in the third of the "Letters on Appreciation" published in January 1780, which some scholars attribute (probably wrongly) to Gouverneur Morris.[4] It was modelled on the small monetary unit included in the Portuguese monetary system. All money would consist of (mostly) decimal based multiples of this money unit and would be mathematically convertible without leftover fractions into all of the state currencies except that of South Carolina. Thomas Jefferson preserved the notion of a decimal system, but rejected the concept of a small, abstract money unit. He favored a larger unit based on a real coin. Jefferson noted that Americans were familiar the Spanish dollar—they had used it in real life and were accustomed to its value. Ordinary Americans would be able to handle the arithmetic. It would be better to have merchants and states change their account books all at once, and have a simple mathematical system thereafter, than to accommodate merchants and states in the short run, but to leave Americans using multiples of 1/1440 of a dollar forever.

Under Morris's plan the silver coins to be produced were:

1. a one hundred unit coin, known as a cent or bit (three of which survive);

2. a 500 unit coin called a quint (two variations of which were produced);

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[3] On the division of the Continental dollar into ninetieths in public accounts, which begins to appear in the journals of Congress in May 1776, see Sumner, *Financier* (above, n. 1), 2, p. 39. No formal decision to make such a division has been identified; the practice seems to have arisen in the calculations of congressional committees overseeing public finance, who were recording many transactions originally made in Pennsylvania currency.

[4] See "Letters on Appreciation" (Philadelphia, 1780), discussed in n. 17 below.

3. And a one thousand unit coin, called a mark (one of which survives). There were also to be larger units made out of gold, but, so far as is known, none were actually created. Also planned were two small copper coins, a 5 unit piece and a 8 unit piece. Only the existence of a 5 unit coin has ever been recorded; it is not known if any 8 unit coin was ever produced.

None of the texts related to the mint discussed how the coins would look. The design that Morris chose can be known only from examination of the coins themselves, specimens of which Morris presented to Congress in April 1783. One side of the coins consisted of a circle of stars, surrounding a radiating eye of providence, with the motto "Nova Constellatio," or new constellation. The other side bore the initials "U.S.," the value of the coin, and the motto "Libertas . Justitia."

After a 5 unit coin was rediscovered in Paris and brought back to the United States in 1977, John J. Ford, Jr., formed a set of four of the coins in 1978, ten years after the Morris Papers project began. When our editors started to annotate texts relating to the coins, we joined forces with Mr. Ford, who in his enthusiasm for his new treasure was undertaking research on the coins and their place in history. Information we held in our files assisted his research. We in turn reviewed his findings, reaffirming some and incorporating it into our notes, exploring some avenues he left untouched, and questioning some points for which we felt the evidence was insufficient.[5]

What Mr. Ford especially emphasized was the background of the Nova Constellatio design, tracing it originally to the design for the American flag developed in 1777. Through the researches of Howard Michael Madaus, he linked the original design to Francis Hopkinson, who has been referred to as the first graphic artist for American notes, coins, and other paper instruments, but who followed in the footsteps of Benjamin Franklin. While we did not conduct original research on the Nova Constellatio design, what we did find tends to

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[5] "Long Lost American Half Cent Comes Back Home," *Coin World,* January 9, 1980, pp. 1-6; "Experts Confirm Link between Flag, Coin," *Coin World*, October 27, 1982, pp. 1 and 58; and, on the recently discovered third cent, see Stack's, 1 May 1991 (Picker), 112 and pp. 25-28.

confirm Madaus's argument. For example, Mary Gallagher, our present coeditor, noticed in a recent book on the American flag by Henry W. Moeller that Morris was listed by Betsy Ross's descendants as one of those who approached her about making the flag. Moeller, like many others before him, challenged the "myth" that Betsy Ross made the first American flag, but argued that she produced naval signal flags used for the defense of the Delaware River, and that both Morris and Hopkinson were involved in naval defense at that time. He argues that the stars and stripe design she produced was not *the* American flag, but may have evolved into it. On June 14, 1777, Congress adopted a motion calling for a flag that would include red and white stripes, and a field of thirteen stars on a blue background, representing a new constellation. From that time on, many flags were produced that were variations on that design, but no one uniform flag was created, and many, including George Washington, considered the stars and stripes the U.S. marine flag, not *the* national flag. However, from that time, stars, grouped into various patterns, became more and more important in American iconography. As illustrated in paintings of Washington done by Charles Willson Peale in 1779, the grouping of the stars in a circle was characteristic of the military standard Washington himself favored.[6]

The eye of providence motif, a Masonic favorite featured in the European emblem books utilized by printers and designers, was first employed in America in designs submitted in 1776 by artist Pierre du

[6] On Morris's supposed involvement in the flag making of Betsy Ross, the design contribution by Francis Hopkinson, and the probability that Ross was in fact sewing naval signal flags, one of which evolved into the official flag of the United States, see Henry W. Moeller, *Shattering an American Myth: Unfurling the History of the Stars and Stripes* (Mattituck, N. Y., 1992), pp. 114-26. On the United States seal, the linkage between currency designs and military standards during the Revolution, and Hopkinson's role, see Edward W. Richardson, *Standards and Colors of the American Revolution* (Philadelphia, 1982), pp. 5, 9-12, 52-53, 57, 179, 182, and 193. Both Hopkinson and Franklin before him based their designs in part on the Dutch emblem book, Joachim Camerarius's *Symbolorum ac Emblematum Ethico-Politicorum*. Charles Thomson's request that various newspapers publish the June 14, 1777, resolution regarding the flag of the United States, so that the design might become generally known, appeared in the *Pennsylvania Gazette* on April 23, 1783.

Simitière for the great seal of the United States. It was linked with a circle of stars in the $40 Continental currency note designed by Francis Hopkinson in 1778 and the two motifs were combined more closely in the design of the standard used by Pulaski's legion. Like the constellation of stars, the eye of providence was also a prominent feature of the design of the great seal which Congress ultimately adopted in June 1782.[7] Congress's consideration in 1782 of the design for the seal probably refocused attention on the concept of the new constellation, reminded leaders of the flag design, and caused the motif, in the form of a circle or oval of stars, to become a feature of artifacts produced during Morris's administration. On the very day that Morris presented his coins to Congress for their consideration, April 23, 1783, Charles Thomson, the secretary of Congress, published an explanation of the flag design to the public to ensure that it was generally known. Its timing leads me to believe that Thomson's action was partly intended to facilitate understanding and acceptance of the coin design by Congress and the public. Although Robert Morris is believed to have been a Freemason, or at least to have been closely affiliated with other Freemasons, it is not known whether the Masonic designs found on the coins is related to such ties, or were merely adaptations of such symbols already included in the designs for the flag and seal.

In my own research, I became interested in the other side of the coin, the "Libertas . Justitia" or "Liberty and Justice" motto which no one had previously discussed in the numismatic literature. The linked concepts of liberty and justice are very familiar to us; we consider it a natural one because of phrasing in the pledge of allegiance—"liberty and justice for all." Yet, in fact, when we looked at the paper money and the coins of the Revolutionary, Confederation and Early National Periods, that linkage was not present. Except for the later, privately produced "Immune Columbia" patterns, no other coins or notes link liberty and justice, and the phrase in the pledge of allegiance did not develop until the late nineteenth century. Furthermore, the concept of justice rarely appears separately on early American

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[7] Howard Michael Madaus, "Nova Constellatio: The Story of a Shared Heritage," *The Numismatist* 96 (February 1983), pp. 238-46.

notes or coins. A justice emblem and the motto "Fiat Justitia" appeared on one Continental currency note, the $65 denomination. When a justice figure coupled with the phrase "To All Their Due" (Aristotle's definition of justice) was proposed in the 1790s as a motif for one of the coins to be produced when the United States mint finally opened, Congress rejected the design.[8]

Why does justice drop out of sight and the figure of liberty predominate on later American coins? My explanation is that the idea of justice became associated with the public creditors' movement—with the campaign for funding the public debt. By the 1790s many of the debt certificates had fallen into the hands of speculators, rather than remaining in the hands of those who provided goods or services during the Revolution. The issue of funding the certificates was highly politicized, and became one basis for the differences between the two parties then emerging, the Federalists and the Republicans. Because it was regarded as a code word for repayment of the public creditors (usually defined as those currently holding the debt certificates, not the original owners), justice was rejected as a motif for national coins, and was not included on subsequent forms of money in the United States. The popularity of liberty was, on the other hand, reinforced by the French Revolution, and liberty figures predominated on the coins produced during the early national period.

Another feature of the reverse side of the Nova Constellatio coins which is unique is the use of the initials "U.S." A design with those initials in the center had appeared on the reverse side of the same standard for Pulaski's legion that had included the eye of providence and the circle of stars, making the Pulaski flag the closest model for the coins. Later American coins spell out the United States of America and never abbreviate it.

No consideration of Morris's coins is complete without mention of a controversial question we have discussed with numismatists over the years, without yet reaching conclusive results. That question is the

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[8] On the justice motif on the 1779 Continental currency note, see Eric P. Newman, *The Early Paper Money of America* (Iola, Wisconsin, 1990), p. 44; on its rejection in 1792, see Don Taxay, *The U.S. Mint and Coinage: An Illustrated History from 1776 to the Present* (New York, 1966), pp. 59-60.

linkage between the public Nova Constellatio pattern coins (Plate 2, 1) which Morris produced, but which did not circulate, and the privately manufactured Nova Constellatio coppers, which did. Controversy still surrounds the copper coins, particularly with regard to where and when they were made. The coppers were circulating in New York by late 1785 and apparently were imitated in part by Vermont coppers produced during that year. It has long been assumed that the coppers were promoted by Robert Morris, or by Gouverneur Morris, with credit generally given to Gouverneur Morris. Newspaper accounts of the period asserted that the coins were produced in England by order of a New York merchant—and that description seemed to fit Gouverneur rather than Robert Morris. Gouverneur's association with coinage designs and with the composition and defense of Robert Morris's coinage plan further reinforced this attribution.[9] Such a privatization

[9] Eric P. Newman, *The Numismatic Scrapbook Magazine* 26, 1 (January 1960), pp. 6-8 "The Source of the Nova Constellatio Copper Coinage," and no. 437 (July 1972), pp. 598-609, "Morris Blazes Trail with Potterns"; and "New Thoughts on the Nova Constellatio Private Copper Coinage," paper presented at the Coinage of the Americas Conference at the American Numismatic Society, New York, October 28, 1995, published in Philip L. Mossman, ed., *Coinage of the American Confederation Period* (New York, 1995). Newman argued that only the 1,000 unit and 500 unit were found in Charles Thomson's desk, while two of the 100 unit pieces were unearthed in nineteenth century Britain, making it likely that cents were sent to England to serve as patterns at about the same time the 5 unit copper piece was given Curwen. However, since many individuals associated with Morris or his administration were in Europe in the 1780s or 1790s, including Gouverneur Morris, William Constable, John Rucker, Daniel Parker, Benjamin Parker, and innumerable French officers, there are many possible means and reasons for the coins to travel to Europe. Efforts to identify a young man in New York who inherited one of the silver coins from his grandfather and sold it during the 1870s have borne no fruit, and therefore gives no clue as to who in America besides Charles Thomson's family retained any of the original coins. See Stack's, 1 May 1991 (Picker), 112, and p. 27.

Newman's paper also asserts that the identification of Gouverneur Morris as the merchant who ordered the coins apparently originated in numismatic notes of Charles Bushnell of New York which Sylvester Crosby quoted, but which were later lost. The British newspaper references on which Newman bases his contention that the coppers were produced in Birmingham, England, include the *London Chronicle, The Morning Chronicle and London Advertiser*, and the *Public Advertiser* for March 11-14, 1786, the *Morning Chronicle and London Advertiser* for March 16,

of coinage was typical of measures Robert Morris took at the end of the revolution, when the Continental government began to dismantle itself after peace arrived in 1783 and did not really regroup until later in the 1780s after the adoption of the new Constitution.

Over the years we have searched many records but we have never been able to confirm that either of the Morrises was involved in production of the coins, or find additional data as to how they were manufactured. It is known that one of the original Nova Constellatio copper coins, the 5 unit coin, was brought to England in May 1784 and presented to Massachusetts Loyalist Samuel Curwen in London by a Mr. Bartlet (or Bartlett). Mr. Bartlet was long identified in the numismatic literature as former congressman and signer of the Declaration of Independence, Josiah Bartlett of New Hampshire. However, this attribution proved incorrect. The relevant entries in Curwen's published diary indicate that Bartlet was a young man from Curwen's hometown of Salem, Massachusetts. Furthermore, our perusal of the microfilm edition of Josiah Bartlett's papers for the period in question revealed that he was in New Hampshire and actively involved in public affairs there as a judge. It was definitely not he who brought the 5 unit coin to England.

Since the time of my talk in 1996, we have been able to learn more about young Mr. Bartlet, who turned out to be rather more interesting, if considerably less respectable than Josiah Bartlett, the signer. Through entries in the journal of Curwen's friend William Pynchon, whose letters Bartlet carried, we have been able to identify him as Joseph Bartlet or Bartlett (1761-1827), a 1782 Harvard

1786, and the *Gentleman's Magazine*, October and December 1786. The March 16, 1786, and later references rebut claims in the earlier papers that the coins were produced in America by order of Congress.

Michael Hodder has challenged the reliability of British newspapers and contends there is no reason to believe the copper coins could not have been made in America. See "More on Benjamin Dudley, Public Copper, Constellatio Nova's and Fugio Cents," and "Benjamin Dudley & Robert Morris: The Saga Continues," *The Colonial Newsletter* 34, 2 (June 1994), pp. 1442-50, and 36, 2 (May 1996), pp. 1623-25. However, his speculation that the copper intended for Morris's mint could have been used for the private issues proved incorrect. See n. 13 below.

graduate from Plymouth, Massachusetts, who taught school briefly at Salem before sailing for England in 1783. Notorious for his wit and eccentricity, he was traveling abroad to seek his fortune. In London he became temporarily famous and popular after attending a play by (General) John Burgoyne which mocked the social origins of some of the American officers depicted in it. Bartlet stood up in the theater and cried "Hurra! Great Britain beaten by barbers, taylors and tinkers!" After a lively, some say dissolute, social life in London, he had a brief career as an actor in Edinburgh, before returning to Massachusetts with a cargo acquired on credit. His ship ran aground on Cape Cod upon arrival. Thereafter, he had a checkered career as a merchant, lawyer, writer, and Democratic politician in Massachusetts, Maine, and New Hampshire. According to one unadmiring nineteenth century sketch, there was "never a better demagogue," for Bartlet harangued audiences in the grog shops and town meetings after he began his legal career in Woburn, Massachusetts. "As odd as Jo Bartlet, was soon a by word," his critic asserted, after Bartlet painted his house black and called it "the Coffin." After moving to Cambridge and later to York, Maine, he was elected occasionally to the state legislature, and came within a few votes of being elected to Congress. As a Democratic politician, Bartlet published pungent satirical political invective, but he best known for a published poem presented at a Phi Beta Kappa anniversary celebration at Harvard in 1799 which unfairly but hilariously and brilliantly lampooned much of the Harvard staff.

How "young Mr. Bartlet" obtained the coin in 1784, we have not been able to ascertain. One guess is that it might have been through the merchant Daniel Parker who was Morris's partner in various business ventures and was originally from Massachusetts. Another possible source is Morris's longtime associate Thomas Russell, deputy marine agent in Boston, who was a nephew of Curwen's wife Abigail Russell Curwen. Bartlet visited the New England Coffee House in London and boarded with and associated with various other New Englanders at that time, and if he did not bring the coin to England himself, someone else from Massachusetts circles may have given or sent it to him, possibly for presentation to Curwen, a noted coin collector.

Whether Bartlet's acquisition of the coin had anything to do with future private production of the coin is not yet known.[10]

The fact that the coin was given away rather freely to a Loyalist in London would lead me to suspect that the five unit coin was not the only copper coin that was made when the patterns were produced. But only seven coins, both silver and copper, have ever been documented.[11] No solid evidence has ever been found of the number made; since the copper coins were relatively inexpensive to produce, there may have been others made which could have served as models for making new versions either in England or in America. Two of the silver coins were also found in Europe, and as Eric Newman has argued, could have been brought there as models for coins. In consultation with Mr. Newman, our staff identified the firm of William Constable and Company as the most likely vehicle for the importation of coins into New York that were ordered by either Robert or Gouverneur Morris, since both men were partners in the firm, but no documentation of that point has yet been found. No description of the Nova Constellatio patterns was included in the journals of Congress or otherwise

[10] Information on Joseph Bartlet or Bartlett was obtained after the time of my talk at the American Numismatic Society through the efforts of project research assistant Thomas Ballinger of the CUNY Graduate Center, confirmed by Edward W. Hanson of the Massachusetts Historical Society. On Bartlet, see Andrew Oliver, ed., *The Journal of Samuel Curwen, Loyalist* (Salem, Mass., 1972), 2, pp. 941, 943, 945, 948, 949, 956, 989-990, 992, 995, and 1000; Fitch Edward Oliver, ed., *The Diary of William Pynchon of Salem* (Boston and New York, 1890), especially pp. 98, 108, 118, 142, 151, 163, 167, 173, 177, 178, 193, 194-195, and 211; and the Curwen Letterbooks, Essex Institute, Salem, Massachusetts. On Russell's relationship with Curwen, see *Curwen Journal*, p. 1027. The only former member of Congress with whom Curwen had contact in London was Nathaniel Gorham of Massachusetts, with whom Curwen returned to the United States later in 1784 (*Curwen Journal*, pp. 1010, 1016, and 1020). Published sketches on Bartlet can be found in the various editions of the *Dictionary of American Biography*; in *Joseph Appleton's Cyclopedia of American Biography* (New York, 1888); and in Ignatius Loyola Robertson, *Sketches of Public Characters Drawn from the Living and the Dead; with Notices of Other Matters* (New York, 1830), pp. 219-40; and James S. Loring, *The Hundred Boston Orators* (Boston, 1852), pp. 405-6.

[11] See *Jefferson Papers*, 7, p. 192, n.; *Coin World*, January 8, 1980, pp. 5-6; and Stack's, 1 May 1991 (Picker), 112, pp. 25-28.

published prior to the production of the coppers. The producers of the coppers had to have access to the coins or inside information about them. Other private coins were produced in 1785 similar to the Nova Constellatio coins or other designs ("Manus Inimica Tyrannis" and "Confederatio") suggested in Congress at the time Morris's plan were being discussed, but no link of either Robert or Gouverneur Morris to their production has yet been found. The "Manus Inimica Tyrannis" design for a piece to be called a crown was suggested in a paper submitted to Congress by Gouverneur Morris (not by Jefferson as a recent article by George Fuld suggested). The "Confederatio" design appeared in a congressional report in the hand of Hugh Williamson and was printed in the *Journals* of Congress. It seems improbable that the coppers including the designs did not emanate in some fashion either from the Morrises or from a member of the congressional committees considering the coins—but there is no reason to believe Jefferson, who was not present when either design was proposed, was involved.[12]

Numismatists have asserted that, extrapolating from the number still surviving, thousands of the Nova Constellatio private coppers circulated in New York and vicinity in the 1780s. Whether they were copied from the coins, the dies, or sketches or descriptions of the original coins has never been established, and how the coins traveled from one place to another is yet unknown. What we were able to confirm from the records was that the copper that Morris had provided Benjamin Dudley from stores of marine department supplies was ultimately turned over to James Jarvis. In 1786 Jarvis contracted with the Board of Treasury (which succeeded Robert Morris) to produce

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[12] For Gouverneur Morris's autograph draft suggesting the crown, see the Papers of the Continental Congress (PCC), no. 26, fol. 557, National Archives, Washington, D.C. His report was printed in the pamphlet "Propositions Respecting the Coinage of Gold, Silver and Copper," a copy of which is found in PCC, no. 26, fols. 551-552; and in Jefferson Papers 7, pp. 198-202, in an arrangement that obscures Gouverneur Morris's writing of that portion of the pamphlet. For that reason, George Fuld mistakenly attributed the proposed design of the Indian trampling a crown, with the motto "Manus Inimica Tyrannis," to Jefferson rather than to Gouverneur Morris. The Confederatio design is in the *Journals of Congress*, 28, p. 358, printed from the original report in PCC, no. 26, fols. 537-42.

the "Fugio coppers," a public supply of copper coins to be used instead of the private coppers then flowing into the country. Since Morris's designs were circulating on private coppers, they presumably could not be used for the Board of Treasury's coins. The board reverted to a design attributed to Benjamin Franklin that was used on the fractional Continental paper money of February 17, 1776, and on mysterious American coins produced in 1776. Since the copper intended for Dudley's use was later turned over to Jarvis, it was not available earlier, as Michael Hodder has speculated, for production of private coins under Morris's auspices in America.[13]

What happened to the remaining property of Morris's mint is yet unknown. No records of its sale or transfer were found in the public accounts. Neither the whereabouts of the dies that Dudley gave Morris in 1783 nor the rollers and other equipment Dudley developed appear in later records. Dudley's later whereabouts and activities are also uncertain.

Some of the people that were involved in Morris's attempt to develop a mint were later employed by the United States mint or were active in other monetary efforts. Dudley supervised the manufacturing of paper for bank notes, Morris's notes, subsistence notes, and debt certificates. He reportedly worked at the Rahway and Morristown mints in New Jersey later in the 1780s, but that identification has recently been questioned by Michael Hodder, who asserts that local

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[13] References to the copper Morris gave Dudley being subsequently delivered to James Jarvis can be found in an entry for October 18, 1791, in Treasury Blotter 15 (January 31, 1791-December 29, 1794), pp. 8274 and 8275, and in an equivalent entry in Treasury Journal D (I) (July 31, 1790-November 29, 1794), p. 2428, in Pre-Federal Central Treasury Records, the National Archives, Washington, D.C. Jarvis was the former London agent for Daniel Parker. A kickback Jarvis gave on the Fugio coinage contract to William Duer, secretary of the Board of Treasury, is described in Robert F. Jones, "The Public Career of William Duer: Rebel, Federalist, Politician, Entrepreneur, and Speculator, 1775-1792" (Ph.D. diss., University of Notre Dame, 1967), 179-182. It is an example of the problems of the committee theory of accountability. There were no reports of bribes or kickbacks under Robert Morris's management, but no one was watching Duer when he worked for the board; and at least one board member (Samuel Osgood or, more likely, Walter Livingston) was in possible collusion with Duer.

blacksmith William Dudley, not Benjamin Dudley, was employed in New Jersey.[14] Both Jacob Eckfeldt, case hardener of the dies, and his son Adam worked for the United States mint, and writings on the family indicate that Eckfeldts worked at the mint from its opening until 1929.[15] Francis Hopkinson, whom Morris had intended to direct the mint, did not live to see it open, and the post went instead to David Rittenhouse, the famous inventer and state treasurer, who, along with Hopkinson, was one of those who examined and approved Dudley's equipment. Blacksmith Samuel Wheeler, maker of rollers and other mint equipment under Dudley's supervision, and David Tew, engraver of some of Morris's dies, apparently had no later roles, nor did gold and silversmith Abraham Dubois, case hardener of some of dies; but it is possible that William Ewing Dubois who worked and wrote with his brother-in-law Jacob Reese Eckfeldt, Chief Assayer at the mint in the nineteenth century, was a member of the same Dubois family. As a senator from Pennsylvania, Robert Morris chaired the Senate committee responsible for drafting the bill for establishing a mint and supposedly was involved in the production of controversial

[14] On Dudley's involvement in papermaking for the Bank of North America, see *Morris Papers* 8, p. 173; for final settlement certificates, see *Morris Papers* 7, pp. 440, 450, and 619; for Morris's six-month notes, see *Morris Papers* 8, pp. 8, 12, 19, 47, 48, 53, 121-22, 142, 246, and 310; and for subsistence notes, *Morris Papers* 7, pp. 70, 125, 232, and 238. Efforts to ascertain Dudley's fate proved unavailing. Although there were several Benjamin Dudleys in New England after the Revolution, a review of the files of Massachusetts Historical Society by Ed Hanson suggested that all were descendants of the prominent Dudley family of New England and none seemed likely to be the same man.

[15] On the long connection of [John] Jacob Eckfeldt and his family with the United States Mint, see Frank H. Stewart, *History of the First United States Mint* (Camden, N.J., 1924), pp. 81-83; and James Ross Snowden, *A Description of the Medals of Washington; of National and Miscellaneous Medals; and of Other Objects of Interest in the Museum of the Mint* (Philadelphia, 1861), pp. 194-95. Additional information regarding the Eckfeldts was provided by Francis Campbell of the American Numismatic Society, documenting their involvement with the mint until 1929; Eric P. Newman and Kenneth E. Bressett, *The Fantastic 1804 Dollar* (Racine, Wis., 1962), pp. 68-69; and "The Passing of the Eckfeldts," in *The Numismatist*, January 1930. I would also like to thank Pete Smith, author of *American Numismatic Biography*, Michael Hodder, and Joel Orosz, for data on the later activities of the Eckfeldts and of William Ewing Dubois.

sample coins featuring the bust of George Washington for the conside-ration of Congress (1791-1792). After heated debate in the House of Representatives, the concept of placing the head of the incumbent president on coins was rejected as excessively monarchical, and the liberty motif adopted instead.[16] There was thus significant carryover from Morris's operations into coinage efforts that were more successful than his original mint plan had been.

THE BANK OF AMERICA AND THE FIRST BANK NOTES

We move now to the second arena of Morris's monetary operations: the Bank of North America. Proposed prior to Morris's plan for the mint, the bank opened its doors in January 1782, just before Morris presented his mint plan to Congress. The Bank of North America was the nation's first commercial bank and its first national bank.[17] Like

[16] See Taxay, *U.S. Mint and Coinage* (above, n.8), pp. 57-59; and Walter Breen, "The United States Patterns of 1792," *Coin Collector's Journal* 21 (1954), pp. 10-13.

[17] On Morris's plan for the bank, see *Morris Papers* 1, pp. 66-74; on its proceed-ings during its first two years in operation, including the evolution of its notes, see *Morris Papers* 7, pp. 795-824; and Elizabeth M. Nuxoll, "The Bank of North America and Robert Morris's Management of the Nation's First Fiscal Crisis," *Busi-ness and Economic History* 13 (1984), pp. 159-70. For Morris's expectations regarding the use of bank notes, see "To the Public, May 28, 1781," and "Circular on the National Bank, June 11, 1781," *Morris Papers* 1, pp. 85 and 142. Bank notes were generally preferred to Morris's notes according to Alexander Hamilton (see Hamilton to Morris, October 9, 1782, *Morris Papers* 6, p. 540).

For the evolution of Morris's views on paper money, which shaped his decisions regarding both Morris's notes and bank notes, see especially Morris to Silas Deane, December 20, 1776, Paul Smith, ed., *Letters of Delegates to Congress 1774-1789* (Washington, 1979), 5, pp. 620-27; "An Address to the Citizens of the State" [Penn-sylvania], [ca. April 10, 1781], Robert Morris Papers, Library of Congress; Morris to Alexander Hamilton, May 26, 1781, to Jacques Necker, June 15, 1781, to Hamilton, October 5, 1782, and to William Whipple, April 7, 1783, *Morris Papers* 1, pp. 79 and 149-51, 6, pp. 499-500, 7, pp. 679-80; and Matthew Carey, ed., *Debates and Proceedings of the General Assembly of Pennsylvania on the Memorials Praying a Repeal or Suspension of the Law Annulling the Charter of the Bank* (Philadelphia, 1786), pp. 37-38, 42, 80-81, and 91.

For the ideas on money that Gouverneur Morris developed prior to assuming office as assistant financier, see the drafts of his essays for 1779 and 1780 found in the

the Continental government, it kept its books in dollars. It quickly adopted a silver standard. Gouverneur Morris advised the bank to overvalue silver, so as to drive "light gold" (the clipped and adulterated gold foreign coins then circulating in America) out of circulation. He wanted to manipulate the values of coins so that the light gold would be exported, but the silver dollars with which Americans were most familiar would remain in the country. Such overvaluation of silver was not only applied to the values assigned coins by Congress and by the mint, but also by the Bank of North America and its imitators, the Bank of New York and Bank of Massachusetts.[18]

We have been able to illustrate most aspects of the material culture of the first bank, but had most difficulty with the one of most interest to numismatists, the first bank notes. Available for study are the early minutes of the bank, many early checks (Plate 4, 6), original newspaper notices for the first bank subscription and for early stockholders' and directors' meetings, and sketches of the first bank building. A reproduction of the first bank office has long resided at the headquarters of its successor bank in Philadelphia, which we first visited when it was known as the First Pennsylvania Bank, but after recent mergers is now CoreStates. There is a handsome portrait of the first president of the Bank of North America, Robert Morris's partner, Thomas

Gouverneur Morris Papers, Columbia University, and especially his "An American" essays printed in the *Pennsylvania Packet* of February 17 and 24, 1780; and Gouverneur Morris to John Jay, March 20, 1780, Richard B. Morris, ed., *John Jay: The Making of a Revolutionary* [John Jay Papers, vol. 1,] (New York, 1976), p. 746. "Letters on Appreciation," three essays published in the *Packet* on January 20 and 25, 1780, and republished as a pamphlet in that year by Thomas Bradford have been attributed, probably wrongly, to Gouverneur Morris. These writings have also been attributed to Peletiah Webster and to an unnamed "Gentleman in Maryland." The true author has not been ascertained. See Paul Smith (above), *Letters* 14, ppp. 362 and n., 372 and n.; Charles Evans, *American Bibliography* (New York, 1941), 6, nos. 16820 and 18614; and comments regarding Gouverneur Morris's possible authorship penned on a copy of the pamphlet held by the New York Public Library. Mark D. Kaplanoff of Pembroke College, Cambridge University, called our attention to the latter notations.

[18] On overvaluing silver, see Gouverneur Morris to Thomas Willing, June 18, 1782, *Morris Papers* 6, pp. 435-44.

Willing, later first president of the Bank of the United States.[19] Recently rediscovered and publicized by its current owner, Ned Downing of Massachusetts, was an original stock certificate of the bank, one issued to John Carter, a military contractor who under his true name of John Barker Church is well known as an in law and patron of Alexander Hamilton.[20] The only known copies of an original bank note are a blank one and a defaced one. The latter is found in the Bank of North America papers at Pennsylvania Historical Society in Philadelphia in an extra-illustrated volume of a centennial publication on the history of the Bank of North America published by Lawrence Lewis. In the design of this note (Plate 4, 5) can be seen an oval of stars, another constellation motif similar to that appearing on the first coins.[21]

MORRIS'S NOTES

We now move on to the third form of money Morris employed, parallel to that of bank notes, what are collectively known as Morris's notes, or notes of the Financier. Such notes were first used prior to bank notes to pave the way for their acceptance and get people accustomed to the use of such notes, but when bank notes failed to meet all the public needs, Morris continued to use his own notes until the end of his administration. Like the original bank notes, Morris's first note was a sight note, payable on demand. Originally, although they were issued for public purchases, particularly supply operations associated with the Yorktown campaign in 1781, Morris's notes bore no indication of public backing or responsibility. They were backed largely by

[19] See *Morris Papers* 7, pp. 802-13; and Elvira and Vladimir Clain-Stefanelli, *Chartered for Progress: Two Centuries of American Banking* (Washington, D.C., 1975).

[20] On the recently discovered stock certificate of the Bank of North America, see Ned W. Downing, "A Real Original," *Barron's*, June 5, 1995.

[21] For illustrations of Bank of North America notes, see the extra illustrated volume of Lawrence Lewis, Jr., *A History of the Bank of North America, the First Bank Chartered in the United States* (Philadelphia, 1882) at Pennsylvania Historical Society; and Newman, *Early Paper Money*, 354-355.

Morris's personal credit and were put into circulation so that people
would provide the carts, wagons, forage, and other equipment needed
for the success of the Yorktown campaign. Morris requested the states
to make his notes receivable on account of taxes and the purchase of
public property, and, as with bank notes, to enact severe penalties for
their counterfeiting.[22] However, he insisted that none of the notes be
made legal tender for private debts because he believed tender laws
had defrauded merchants of their property during the period of
wartime currency depreciation. Morris also held that tender laws
discredited the money they sought to sustain, since, he asserted,
people naturally doubt the value of something they are forced to
receive.[23] Like most notes of the period, Morris's notes were indented
notes, with a torn edge matchable to the other piece remaining in the
book of notes from which it was removed (Plate 3, 3). The sight notes
were copper plate notes engraved by Robert Scott who also engraved
the plates for the original bank notes and for public bills of exchange.
Scott became the engraver for the U.S. mint in 1793 and served until
1820. All later notes of Morris's administration were made by printers

[22] For descriptions of Morris's notes, see Morris to the Receivers of Continental
taxes, August 29, 1782, *Morris Papers* 6, pp. 276-79; and Newman, *Early Paper
Money*, 50, 52. On bank notes, see Newman, *Early Paper Money* (above, n. 8),
pp. 354-55; and *Morris Papers* 1, pp. 394-95, 4, pp. 219, 230-31, and 267, 7,
pp. 796-97, 813, 814, 821-22, and 824; and the records of notes issued found in the
Bank of North America Papers, Pennsylvania Historical Society. On Morris's inten-
tion to substitute bank notes for his own notes, see Diary, August 28, 1781, and
Morris to John Langdon, February 19, 1782, *Morris Papers*, 2, p. 120, 4, p. 267.

[23] On Morris's opposition to tender laws, which he also believed had driven specie
from circulation, see, for example, Morris to George Washington, June 15, 1781, and
to the Governors of North Carolina, South Carolina, and Georgia, December 19,
1781, *Morris Papers 1*, p. 153, 3, p. 414. On the destructiveness to the credit of
paper money of legal tender laws, see also Silas Deane to Morris, February 23,
1781, *Morris Papers* 1, pp. 11-12; and [Gouverneur Morris], "A Citizen" to the Penn-
sylvania Assembly [1780?], Gouverneur Morris Papers, Columbia University. An
even stronger statement of this point was made by Peletiah Webster, who in an
article republished in his *Political Essays* in 1791, asserted "It is not more absurd
to attempt to impel faith into the heart of an unbeliever by fire and fagot, or to
whip love into your mistress by a cowskin, than to force value or credit into your
money by penal laws" (cited by Newman in *Early Paper Money* [above, n. 8] p. 4).

Hall and Sellers on specially watermarked paper manufactured by Mark Willcox of Chester, Pennsylvania, under supervision of Benjamin Dudley. Willcox's firm went on to become the chief producer of early American bank notes.[24]

Practices similar to those developed for Morris's notes were used for all the changes made to the original Bank of North America notes, whose evolution we were able to trace through notations made in the bank's papers. Through these documents we were able to ascertain the denominations of the bank notes and the changes made in the paper used. Among the significant features we discovered was the policy followed in the selection of denominations of currency. It was the "common wisdom" of the time that notes of small denominations were more likely to depreciate because they were more easily counterfeited, and because the general public was disenchanted with paper money and did not have the knowledge with which to appraise the authenticity or worth of the notes. It would therefore be particularly risky to put notes of small denomination into circulation that would be usable in the transactions of ordinary people. Instead banks should issue larger notes used by merchants who had access to the information necessary to appraise them.[25] Such views also applied at that time to the notes of the Bank of England. The smallest of that bank's notes up to that time was ten pounds, and only dropped to five pounds in 1784.[26] Consequently, in the case of both bank notes and Morris's

[24] On Willcox and his later production of American bank notes, and on Robert Scott's role as engraver for Morris and later for the mint, see *Morris Papers* 1, pp. 339 and 394-95. William Kinnan, the copper plate printer for the U.S. from 1778 to June 1782, who had been responsible for printing bills of exchange and loan office certificates, printed the first bank notes, *Morris Papers* 3, pp. 107-8, 404, 5, pp. 341, 412; *JCC* 12, 892. Kinnon received minor payments for work from the Board of Treasury, but otherwise appears to have no further monetary role, see *PCC*, no. 141, II, pp. 183 and 475.

[25] Morris described his twenty dollar notes as "small notes" designed for circulation and tax collection, and declined to go any lower (see Morris to James Lovell, September 10, and to Hamilton, October 5, 1782, *Morris Papers* 6, pp. 350 and 500). Presumably Morris's main hope for money usable in smaller transactions was his plan for a mint.

[26] Bank of England notes were not intended for hand-to-hand circulation during the eighteenth century, but as a substitute for gold in large transactions. See Charles Kindleberger, *A Financial History of Western Europe* (London, 1984), pp. 76-77.

notes, no denominations smaller than 20 dollars were issued at first. Many of the civil servants who had to purchase goods or services on public account complained that the notes were too large for the payments they had to make. Most Americans did not conduct large transactions and did not have large tax payments to make, they explained. They begged Morris to issue smaller notes which would be more readily accepted, but he long resisted their requests.[27]

In the case of the Bank of North America notes, the bank first issued notes of large denominations, 20 dollars and above, up to 500 and 1,000 dollar notes. The larger notes were soon dropped as too large to use. But only after the initial notes became known and were accepted did the bank issue the 10 and 15 dollar notes. It was not until 1784, after peace was well established, that a five dollar note was issued. The notes therefore did not circulate broadly among average persons, but remained mostly in the hands of merchants and other men of business who conducted larger transactions.

Among the other procedures adopted by the first bankers with regard to notes were rotations of the paper used. Every six months or a year the bank changed the water marks on the notes and also the "complexion" or color of the paper—all the work was done by the team of Dudley, Willcox, and Hall and Sellers, who handled such practices for the notes and certificates produced from mid 1782 on during Morris's administration. Although the first notes were printed on white (actually yellowish) paper, colored threads, first blue, then red, were introduced into the paper, so that, again in an echo of the flag motif, notes were alternately red, white, and blue. Such practices were of course intended to deter counterfeiting of the notes. Some bank notes were counterfeited despite these precautions, although, unlike the case of Morris's notes, the bank never admitted this in public during its early years. Rather than risk undermining public confidence, the bankers apparently chose during the 1780s to keep it secret that a

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[27] For requests for smaller notes, see Hamilton to Morris, September 21 and October 25, the Quartermaster General to Morris, September 19 and November 5, and William Churchill Houston to Morris, November 2, 1782, *Morris Papers* 6, pp. 413 and 500, 7, pp. 5-6 and 15.

few counterfeit notes had actually slipped past them. But it does not appear to have been common, and the bank continued to follow the same pattern of introducing changes in notes first in the larger denominations, and only after they became familiar, applying the changes to the smaller denominations.[28]

Returning to Morris's notes, the alternate form of paper money used during Morris's administration, we will recall that the first notes bore no sign of public responsibility. They were later modified to indicate their public nature through changes in the wording of the text and through the watermarks embodied within them. As with the first coins, Morris did not have explicit official sanction for producing Morris's notes. Congress granted Morris broad authority when he took office, and he often acted on his own in devising financial stratagems, seeking formal approval only for new endeavors like the bank or particularly risky exploits like his overdrafts on foreign loans. Congress never abrogated Morris's monetary initiatives, but their lack of explicit backing sometimes left him vulnerable. Once peace arrived, and Morris's political opponents felt secure enough to seek to reduce his powers and ultimately drive him from office, some questioned his authority to issue notes. They tried to limit the resources available to him to cover his notes and implied he would be personally liable for their payment—that he could be sued by their holders should the government fail to redeem them. And indeed Morris considered himself liable, even for the later notes which in text and watermarks indicated that they were national, not merely personal obligations. Upon leaving office in 1784 he set up a special fund to handle the redemption of those still outstanding, rather than trusting their fate to his successors.

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[28] On precautions against counterfeiting, see especially the material on bank notes printed in the appendix to *Morris Papers* 7, p. 824. On the counterfeiting of notes, see Morris's circular to the receivers of Continental taxes of November 8, 1782, and Notice of Counterfeit notes, November 8, 1782, *Morris Papers* 7, pp. 27-28; Morris to George Webb, May 5 and June 10, 1783, and Daniel Parker to Morris, July 17, 1783, and notes, *Morris Papers* 8, pp. 7-8, 181, and 300-303; and William T. Hutchinson, Robert A. Rutland et al., eds., *The Papers of James Madison* 6, pp. 415, 416 n.-417 n., and 423. According to Newman counterfeiting of large numbers of $20 Bank of North America notes was publicly announced 1794.

Nevertheless, the notes were in fact public—they were issued for public purposes and ultimately redeemed with public resources.[29]

The information now available about Morris's notes, far more than that related to the coins, illustrates the accomplishments of collaboration between documentary editors and numismatic experts. At the time our project began in the 1960s, no sample of any Morris note was known to exist. In the 1970s sight notes were discovered by Eric Newman who had been corresponding with our project regarding the notes in order to include them in his book. We informed him that we had descriptions of the notes in circular letters Morris sent to the receivers of Continental taxes in the various states, and that in November 1782, after the notes were counterfeited, he had sent the receivers canceled examples of the true notes that could be used to differentiate true from false. Morris had appointed receivers for each state who were responsible for receiving and forwarding revenues collected in fulfillment of Continental tax requisitions, as well as for promoting the levying of taxes and implementation of the appropriate enforcement legislation and otherwise supporting national interests and policies within the states. There were three repositories holding large collections of papers of the receivers that included nearly complete runs of correspondence from Morris. We had obtained from these collections recipients' copies of the letter forwarding the sample notes, but none included a note. However, when Newman wrote the repositories inquiring whether the notes could be found anywhere in the relevant collections, three samples were ultimately located: one in the William Churchill Houston collection at Princeton University, which we used as an illustration for our edition (Plate 3, 3), one in the Morris-Harwood collection at Maryland Historical Society, and one in William Whipple papers at Massachusetts Historical Society.[30]

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[29] For Morris's personal pledges of redemption, see the notes to Morris's "Circular to the Receivers of Continental Taxes," August 29, 1782, Morris to a Committee of Congress, April 14, 1783, and notes, the headnote to Morris to the President of Congress, May 1, 1783, and his published notice of October 11, 1784, *Morris Papers* 6, p. 279, 7, pp. 701 and 767-75, and 9 (forthcoming).

[30] Eric P. Newman, "The Official United States Circulating Currency of Robert Morris: A New Find in American Numismatics," *The Numismatist* 1977, pp. 2230-36.

In explaining Morris's notes in his writings, Newman employed the terms "short bobs" and "long bobs" that according to one of Morris's former clerks, James Rees, had been popular expressions used for Morris's notes. This play on words on Morris's nickname expressed differences in the amount of time the holder had to wait before notes were payable. Notes payable quickly were, of course, more desirable, and usually more valuable, than those with a distant due date. Newman speculated that the terms applied to differences between the sight notes and the 60-day notes which succeeded them, or between the 60-day notes and those with sights of six months or more. However, our project has not endorsed that interpretation, holding that the terms might also apply to any of the timed notes, depending on how long someone accepting the note would have to wait for payment. Thus, a merchant or speculator accepting a six-month note in November 1783 would prefer one issued in June that was payable in a month (a "short bob") to one issued in October that would not be redeemable for five more months, and would thus be a "long bob." I personally consider the latter the most likely explanation for the way businessmen used the terms "short bob" and "long bob," but no further data has yet been found that would prove the point conclusively.[31]

Since the time Morris's sight notes were found, we have been searching for the later versions of his notes with limited success. We failed to locate any copy of Morris's 60-day notes, or any of the domestic bills of exchange with irregular values and sights that Morris issued, usually for payments to contractors. Through John Catanzariti's collaboration with James Harwood in the fiscal records division of the National Archives, we located a blank volume of Morris's six-month notes issued in 1783 primarily for army pay at the time of disbandment (Plate 5, 7).[32] For most of Morris's administration,

[31] On "Long Bobs" and "Short Bobs," see Sumner, *Financier* 2 (above, n. 1), p. 151; Orasmus Turner, *The History of the Pioneer Settlement of Phelps and Gorham's Purchase and Morris's Reserve* (Rochester, N.Y., 1851), p. 242; and Newman's discussions in *Early Paper Money* (above, n. 8) and "Official U.S. Circulating Currency" (above, n. 30).

[32] On Morris's six-month notes, see *Morris Papers* 8, pp. 305-12, especially the illustrated sheets printed between pp. 310-11. The blank pages of notes are from a

Congress had been able to feed and, to some extent, cloth the army, but not to pay them. Both General Washington and Congress were nervous about sending troops home unpaid. Since there was not enough hard money available with which to pay the army, and appeals to the French for cash proved unavailing, the only approach Morris could think of was to issue notes at relatively long sight to the troops and hope that the states would be able to redeem them or that other resources could be found by the time they fell due. The troops could take the notes home to their states and try to redeem them there, use them to pay their taxes, or sell them at discounted rates to merchants and speculators.

Because tax collection remained slow, Morris had since 1782 been lengthening the time at which his notes would fall due. In August 1782 he switched from sight notes to 60-day notes, then in June 1783, he was forced to resort to six-month notes to gain more time in which to pay off the notes. We have not yet found any filled out version of the six-month notes, despite the fact that more than a half million dollars worth of those notes were issued. Consequently, it is examples of the blank pages of notes found in the National Archives that we use as illustrations in volume 8, and that Eric Newman employs in the most recent editions of his book.

Knowledge of the blank pages proved helpful in leading me to a new discovery. In 1995, while searching the Constable papers at the New York Public Library, I discovered a modified version of Morris's six-month note that was issued under the authority of the Board of Treasury which replaced Morris after his resignation from office. The board cut off the top of the note, which had Office of Finance and a partial dateline printed on it, and changed the way the blanks were to be filled out. The board then turned the blanks over to Paymaster General John Pierce who filled out and signed the notes and issued them to pay the small United States army that remained after 1784 (Plate 3, 4). Since Constable and Company held contracts with the Board of Treasury to make payments on the foreign debt and to transfer to the treasury tax

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book labeled Certificates of the Office of Finance (Blank), 1783, found in the Records of the Bureau of the Public Debt, Record Group 53, Pre-Federal Department Records, National Archives.

revenues collected in distant states, the firm's papers contain much important material related to the board's transactions. This note is probably what is referred to in some documents as a Pierce note, as distinguished from one of the Pierce final settlement certificates, the interest-bearing debt certificates issued for back pay and other debts due to members of the Continental army. So far as I know this is the only filled out version of the six-month notes yet found, but perhaps disseminating a description of the note may reveal the existence of others.[33]

That was recently the case with another type of note issued during Morris's administration which was identified and sold in 1996 largely on the basis of information found in our edition. The new find is what is called a "Hillegas note" or "subsistence note." This was a separate type of note issued under Morris's authority in 1783, and probably in early 1784, but signed not by Morris but by U.S. Treasurer Michael Hillegas. They were issued for army subsistence, that is, for the food and clothing allowances made available for army officers. This allowance was supposed to be paid in cash, but no money was available. Officers could take subsistence notes to military contractors or other merchants and use them to purchase the supplies they desired, instead of being issued standard rations or clothing that the officer may or may not want. Until explained by our project in the course of our work on volume 7, subsistence notes were completely unknown. They were not mentioned in the standard works on either paper money or debt certificates and, prior to the last year, none were known to exist. Eric Newman included a description of the notes in his most recent edition of *Early Paper Money*, based on information we made available, but, like our edition, he was unable to illustrate it. Then, in 1995, R. M. Smythe and Company of New York was brought a note

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[33] On the number of Morris's notes issued, see Morris's reports to Congress of July 15, 1783, and especially of November 10, 1783, which includes an account of notes issued on the credit of the United States, the amount paid, and the amount remaining in circulation. Unfortunately no data has yet been obtained on the earlier, more private, Morris notes, especially on the crucial question of the extent to which they were employed to finance the Yorktown campaign in 1781. See *Morris Papers* 4, p. 371, 6, p. 231, and 8, pp. 31-32, 272, 353-54, 50-51, 305-12, 119-20.

which had been buried for 200 years within the papers of a southern family. Smythe and Company was able to identify what it was based on our descriptions of the notes—data we had derived mostly from a newspaper notice published in November 1783 regarding theft of some of the notes. The mail had been robbed in Princeton, New Jersey, and a package of the notes was among the items stolen. Fortunately, the thief did not know what they were or thought they were too "hot" to use, and abandoned them in a field where they were recovered by a "Negro fellow" and returned. Before that happened, however, Morris authorized a newspaper notice which listed the denominations, watermark, and handwritten markings on the stolen notes. We were able to use this list to ascertain the standard denominations and marks employed on Hillegas notes. When a sample finally did turn up, we found to our delight, that it exactly matched the description we had given of the notes. Hillegas notes differed from Morris's notes, in that they were issued in lower denominations; they started as low as one dollar, and the bill auctioned is one of that denomination. Because of their small size, they did apparently circulate somewhat more broadly than the other notes, at least in New Jersey, where they are mentioned in the letters of receiver William Churchill Houston. Thus, subsistence notes did not remain exclusively in the hands of the contractors and a few selected individuals, as the Smythe auction catalogue suggested.[34]

This find well illustrates the benefits of the scholar-numismatist-collector collaboration. After volume 7 came out, I consulted with Eric Newman, John Ford, and others, about whom I should inform about the material in our edition. Some one suggested that some numismatic publications might not be interested in information about Morris's notes and coins because they could not be collected. They either no longer existed, were exclusively in the hands of public repositories, or were too rare and expensive to be acquirable. And yet, once the information became known, samples were found, and, in the most recent case, did become available to private collectors. We are hopeful that this process

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[34] On Hillegas (subsistence) notes, see *Morris Papers* 7, pp. 70-71, 8, pp. 744 and 746; "First Ever Offering of a 1783 Subsistence Note," R. M. Smythe Catalogue, 1996; Newman, *Early Paper Money* (above, n. 8). p. 52.

will continue and that notes or coins for which we have as yet no samples, such as Morris's sixty-day notes, will someday be found.

Another recent find that gives us hope for the future is another type of note that grew out of the notes issued during Morris's administration. In 1785-86, Morris issued and circulated personal notes similar to his pubic ones. He used them to purchase tobacco in Maryland and Virginia to fulfill a private contract with the Farmers General, the French tax-collecting syndicate which also held a monopoly on the purchase and sale of tobacco in France. Because it was difficult to obtain and transport enough specie to buy up large amounts of tobacco over a wide area, Morris advised his agents to use his notes wherever possible. The earliest form of the notes was redeemable at sight in Philadelphia in specie or in bills of exchange drawn at a favorable exchange rate on either Britain, France, or Holland. Legislation in Virginia forbade the circulation of such private notes, but after some thought Morris concluded that no state law could prevent someone from giving personal notes in payment to those willing to accept them, and he continued to use the notes whenever possible. Later he divided the notes into two types, one payable in specie, and the other in bills of exchange. Blank pages of the earliest of these notes recently showed up on the auction market and were identified by us. Samples are now in the hands of collectors. Eric Newman reportedly expects to include the notes in his next edition of the *Early Paper Money of America*.[35]

More available to collectors are another outgrowth of Morris's notes—the large number of personal notes which he and his partner John Nicholson drew and circulated to finance their land speculations

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[35] On Morris's tobacco notes, see the notes to Morris's agreement with William Alexander and Jonathan Williams, Jr., March 4, 1784, *Morris Papers* 9 (forthcoming); Morris's correspondence with William Alexander and Company and with Tench Tilghman and Company, in the Arents Collection and the Robert Morris Papers, New York Public Library, and in the various collections of Tilghman Papers at Maryland Historical Society; Sumner, *Financier* (above, n. 1), pp. 158-60 and 173; and Jacob M. Price, *France and the Chesapeake: A History of the French Tobacco Monopoly, 1674-1791, and of Its Relationship to the British and American Tobacco Trades* (Ann Arbor, Mich., 1973), 2, p. 755.

in the 1790s, which ultimately contributed to the bankruptcy of both and their imprisonment for debt. Such notes made it possible to expand their debt to huge amounts and involved large numbers of other merchants in their financial troubles, thus worsening the economic impact of their collapse. While we have not written about these notes—which fall beyond the parameters of our edition, photocopies of some have been made available for our files by various repositories and collectors.[36]

Although they also fall somewhat outside the parameters of this paper, I would also add that our series has sought to illustrate and explicate the various debt certificates of the Revolutionary and Confederation era, both the early ones which Morris sought to fund under a funding plan which ultimately failed to be ratified by the states, and the ones created during his administration under plans for settlement of the revolutionary debt. In volumes 6 and 7 we included examples of

1. loan office certificates,

2. quartermaster certificates issued for supplies by the Quartermaster Department,

3. civilian final settlement certificates issued by the commissioners of accounts Morris appointed to settle claims against the Continental government, and

4. army final settlement certificates issued by Paymaster General John Pierce.

Copies of most of these were obtained from the National Archives through John Catanzariti's consultation with their staff.[37]

Another form of collaboration with the National Archives that has borne fruit has been our use of the index of the Papers of the Continental Congress that was one of the major bicentennial projects of the archives staff. For example, we were able to identify and locate a long

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[36] On the notes and bills drawn in the 1790s by Morris and John Nicholson, see Sumner, *Financier* 2 (above, n. 1), p. 283.

[37] On the impost of 1781 and subsequent funding plans, see Morris to the President of Congress, July 29, 1782, and March 8, 1783, and notes, *Morris Papers* 6, pp. 36-84, 7, pp. 513-38. For illustrations of debt certificates, see William G. Anderson, *The Price of Liberty: The Public Debt of the American Revolution* (Charlottesville, Va., 1983; and *Morris Papers* 6 and 7.

missing account book of Morris's notes that Morris submitted at Congress's request in November 1783. Although the archives indexers did not know precisely what these books were, their description was sufficiently clear to inspire us to check the item on microfilms, and to match it to the description found in the letter with which the accounts were forwarded. The extant account book enabled us to estimate the number of six-month notes issued and redeemed as of that date, and showed the lengths to which Morris had to go to provide data to meet the queries and challenges raised by his critics in Congress after the end of the war.[38]

In summary, a number of factors have come together in the years since our project was founded to expand greatly knowledge of the notes and coins of the Confederation era. These factors include:

1. Our own research and that of other modern documentary editions.

2. The microfilming, indexing, and research projects conducted by the National Archives and Library of Congress in conjunction with the Bicentennials of the American Revolution and United States Constitution.

3. The rediscovery of the 5 unit Nova Constellatio copper coin; its purchase and addition to a set of the silver patterns by John J. Ford, Jr., and his sponsorship of additional research on his prize.

4. The ongoing revisions and updates Eric P. Newman has undertaken for his book and articles. And

5. The discoveries of the collectors and auction houses particularly interested in financial history.

Hopefully, continued collaboration among all these interested parties will enable us to find answers to the many questions as yet unsolved.

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[38] Records of notes issued in 1783 are discussed in *Morris Papers* 8, pp. 744-45. I located one of the account books recording the note issues through a cryptic entry in the *Index to the Papers of the Continental Congress, 1774-1789*, published in 1978 by the National Archives.

FALSE WESTERN AMERICAN GOLD BARS

T. V. BUTTREY

PRIVATE GOLD COINS OF THE WESTERN UNITED STATES

After the discovery of gold in California in January 1848, there was a surge of optimistic immigration. This imposed considerable strain on the circulating coinage for two reasons. On the one hand, the relatively small amount of specie available before the flood of immigrants arrived was now totally inadequate. On the other, the huge quantities of gold now torn from the earth could not be used as money with any ease, as bags of gold dust were very awkward to handle and their value was always insecure. One longer-term answer to the problem came with the opening of the San Francisco Mint in 1854, but for half a decade before, and even for some time after, the immediate problem was mitigated, if not solved, by the production of private gold coins in the names of a number of assaying firms. Gold bars were also produced in 1849-50 by F. D. Kohler, State Assayer, and by the firm of Moffat & Co., which also went on to strike coin. The history of this western gold coinage has been told many times, and will not be repeated here. The reader can easily turn, for example, to the work of Breen.[1]

This article is a revised version of the Huntington Medal Lecture, delivered at the American Numismatic Society on 16 March 1996, with the author's addendum.

[1] Walter Breen, *Encyclopedia of U.S. and Colonial Coins* (New York, 1988). Donald H. Kagin, *Private Gold Coins and Patterns of the United States* (New York,

It is clear from the contemporary sources that the western coinages came to be known in the eastern United States fairly quickly. When Eckfeldt & Du Bois, assayers at the Philadelphia Mint, published notes on new coins they were able to include California coinages struck in prior years.[2] They knew not just the relatively common issues of Moffat or the U.S. Assay Office, but also the really scarce issues like Ormsby or the Pacific Company. They even had examples of both denominations of the Oregon gold coinage. In fact their listing is a complete array of the different firms which had been producing gold coin up to their time, including the bars of Kohler and Moffat.

Of course Eckfeldt and Du Bois could not include later issues such as those of Wass Molitor, or the Colorado coiners. For the earliest appearance of those in the East it is convenient to check the numismatic auction catalogues, following their listing in John W. Adams.[3] The results can be seen in Figure 1. The vertical bars indicate the decade within which the earliest reference to coins of any given firm can be found. For the 1850s, Eckfeldt and Du Bois are the source; thereafter, the auction catalogues.[4] If anything, the bars run too far

1981), includes an extensive text and catalogue. Unfortunately, the text, which is highly detailed, is entirely without footnotes and is unkeyed to the substantial bibliography. Consequently it is impossible for the reader to judge its accuracy or its originality, and it cannot be used as a reliable secondary source. Kagin's illustrated catalogue is similarly inadequate in not indicating the sources of his material, and includes a number of items which will be judged below to be twentieth-century fabrications.

[2] Joseph R. Eckfeldt and William E. Du Bois, *New Varieties of Gold and Silver Coins*, 3rd ed. (New York, 1852).

[3] John W. Adams, *United States Numismatic Literature*, vol. 1, *Nineteenth Century Auction Catalogues* (Mission Viejo, CA, 1982), vol. 2, *Twentieth Century Auction Catalogues* (Crestline, CA, 1990).

[4] The firms acknowledged in Eckfeldt and Du Bois (1852) were: Baldwin & Co., Cincinnati Mining & Trading Co., Dubosq & Co., Dunbar & Co., Massachusetts & California Co., Miners' Bank, Moffat & Co., Norris Gregg & Norris, Ormsby, Pacific Co., Shultz & Co., Templeton Reid, U.S. Assay Office [Humbert]; Moffat ingot, Kohler ingot; Mormon, Oregon Exchange Co. In 1852 the U.S. Mint collection included "a complete set of California gold pieces" (p. 72), as well as all four Mormon denominations and both Oregon denominations. Coins of the western firms striking after 1852 appeared, at the latest, in auctions: Clark Gruber (Woodward, 2 May 1883), Conway (Cogan, 22 Oct. 1878), Kellogg (Woodward, 10 Jan. 1881),
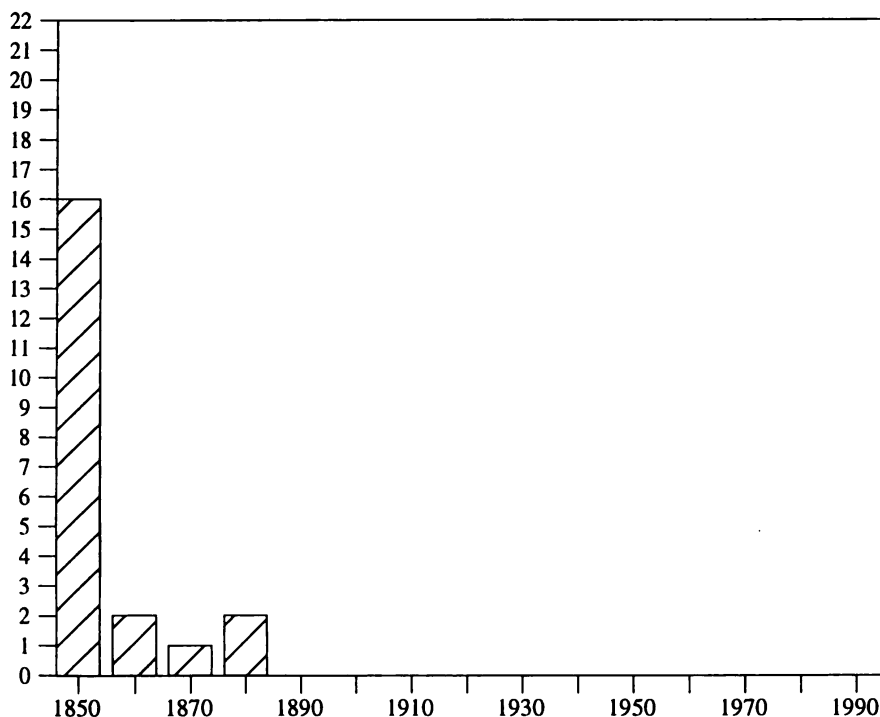
FIG. 1: EARLIEST DECADE OF APPEARANCE IN THE EAST OF FIRM NAMES STAMPED ON GOLD ISSUES, INCLUDING MOFFAT AND KOHLER

to the right—that is, the date at which a given piece appears at auction is only the terminus ante quem for its appearance on the market at all, so that some of the references could reasonably be pushed back to the left, earlier than their overt appearance here. But that does not affect the general point: the corpus of issuing firms was fixed by the mid-1880s (and no doubt really rather earlier). When Edgar Adams published his listing a quarter-century later, in 1909, nothing had been added. When Wayte Raymond published his own in 1931, more than twenty years after Adams, the corpus of coin-issuing firms was still unchanged.[5]

Parsons (W. H. Smith, 1885, but known from newspaper accounts in 1861); Wass Molitor & Co. (Woodward, 20 Mar. 1865).

[5] Edgar H. Adams, *Adams' Official Premium List of United States Private and*

Adams' and Raymond's booklets were intended for collectors of western American coins. Collectors' interest in private gold had long been evident and can be documented through the auction catalogues. Figure 2 is drawn from John Adams' listings of the major numismatic auction companies and indicates how many sales per decade included
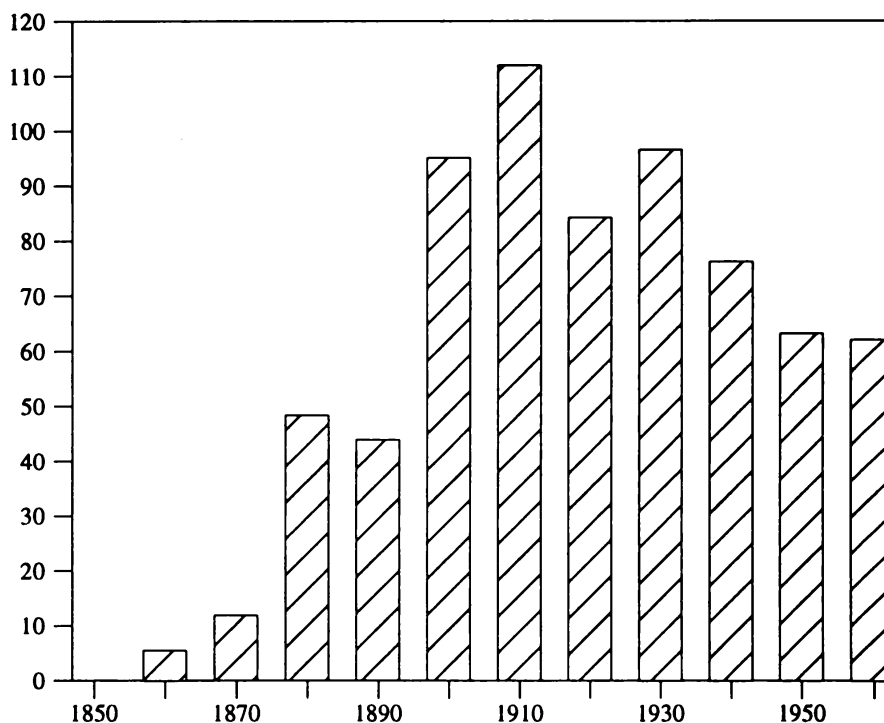
FIG. 2: NUMBER OF AUCTION SALES INCLUDING PRIVATE
AND TERRITORIAL GOLD

Territorial Gold Coins (New York, 1909); Wayte Raymond, *Private Gold Coins struck in the United States, 1830-1861* (New York, 1931). Both authors included the Kohler and Moffat bars. The catalogue of private gold coinages remains essentially unchanged to this day, namely, in California, the output of Baldwin & Co., Dubosq & Co., Dunbar & Co., Humbert, Kellogg & Co., Kohler (bars), Massachusetts & California Co., Miners' Bank, Moffat & Co. (including bars), Norris Gregg & Norris, Ormsby, Pacific Co., Shultz & Co., U.S. Assay Office, Wass Molitor & Co.; in Colorado, Clark Gruber & Co., Conway & Co., Parsons & Co.; in Oregon, Kilborne Magruder; in Utah, the Mormon coinages. For convenient illustration of the various issues, denominations and varieties see R. S. Yeoman, *A Guide Book of United States Coins*, ed. Kenneth Bressett, (annual, current).

something in the way of private and territorial gold. The slow beginning is a function not only of the availability of the material but also of the small number of auctions in the 1860s and 1870s. The falling numbers in the most recent decades are illusory, in that more and more auction sales were conducted by dealers not included by Adams. The exact numbers are not significant here; the important point is that the collecting of private and territorial gold is about as old as its production. Already in the last century there was a vigorous market for this interesting material—John Adams lists over 200 nineteenth-century auctions which included something in the way of private gold—and that means that new examples, and preferably new varieties, would have been sought out by dealers and collectors. The collecting of western American gold is not a recent phenomenon.

FALSE MEXICAN COLONIAL GOLD BARS

Some years ago I published a study of a group of Spanish colonial gold bars.[6] These are cast objects, bearing the legend HISP ET ID in the casting but otherwise adorned with a variety of punches. These have the date 1741, 1744, or 1746 and (usually) the Mexico mintmark, as well as a number of other more obscure markings including in some cases the impression of a pillar-dollar die. Perhaps 60 to 80 bars are known, all forming a single family, as is proved by the use of common punches.

The Mexican bars began to come on the market in the late 1950s.[7]

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[6] "False Mexican Colonial Gold Bars," *Memorias de la Academia Mexicana de estudios numismáticos* 3.9 (1973-74), pp. 21-42 (English), 43-64 (Spanish); an additional note in "False Mexican Colonial Gold Bars," *Bulletin on Counterfeits* 4.1 (Spring 1979), p. 6.

[7] The primary source was John J. Ford, Jr., the bars allegedly having been recovered from a wreck of 1748 (letter of JJF to TVB); some individual bars consigned by him include: Seaby's *Coin and Medal Bulletin* 528, May 1962, G765; Hess-Leu 20, 17 Oct. 1962, 856-58; Seaby's *Coin and Medal Bulletin* 546, Nov. 1963, G2484; Hess-Leu 27, 14 Oct. 1964, 1592. The nine bars in the Lilly Collection, now in the Smithsonian, came to the collector through Stack's. Others appeared in several Stack's auctions (see n. 8).

The bars were explained as representing bullion payments of the King's Fifth, the 20% tax on the extraction of precious metals.[8]

There are several problems. First, the history of the bars is a blank. The assertion in the auction catalogues that they had to do with the exaction and payment of the King's Fifth is not supported in any historical source. In fact they are not mentioned in the sources at all. That might not surprise us: we cannot expect original documentation on everything that we study. But we know that the mint was *forbidden* to receive metal from which the Fifth had not already been deducted, which makes the usual story unlikely. Since the historical claims made for the bars in the auction catalogues have never to this day been supported by a single reference to any original source, such explanations can be regarded as fictitious. That of itself does not make the bars false, but a second peculiarity is that none of them had ever appeared on the market before the 1950s. They were not known in any collection in Mexico, Spain, or the United States.

The solution is in the bars themselves. One curiosity of their manufacture is the large number of varieties created by the manipulation of the punches, that is in their selection and the variety of their positioning—this in a product which demanded uniformity. More important, the manufacturer tripped up by punching on bars purportedly of the 1740s an obverse pillar dollar die of a variety which was introduced only in 1754, when the royal crown of the left-hand pillar was replaced by the imperial crown, and a reverse with assayer's initials appropriate only to 1770-71. These impossible combinations prove that such a bar is false, and since the Mexican bars form a single family, they are all false. I would call them fantasies, rather than counterfeits, since they do not represent any original. Who made the bars is not known to me; no doubt some who auctioned or sold them did not know them to be false.

In 1990 E. G. V. Newman was able to add another level of proof by submitting a sample of one of the Mexican bars to metallurgical analysis.[9] His results were these:

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[8] E.g. Kreisberg/Cohen, 29 June 1970, to 362; Stack's, 11 Nov. 1974 (Gibson collection), to 270-71; Stack's, 2 Feb. 1983 (Detmer collection), to 185; most recently, Stack's, 8 Dec. 1993, to 2515-17.

[9] E. G. V. Newman, "Spanish Colonial Gold Bars from the Mexico Mint," *Spinks'*

	parts per 100		parts per 1,000,000
gold	91.2	aluminum	2
silver	6.8	cadmium	5
copper	1.8	calcium	< 1
		iron	100
Total	99.8	lead	20
		magnesium	< 1
		manganese	1
		nickel	< 1
		silicon	3
		tin	300
		palladium	10
		Total	444

100% - .0444 trace elements = 99.9556% (gold + silver + copper)

The gold is comfortably of good quality; the problem lies in the trace elements. These are too low. "The spectrographic analysis shows the bar to consist of high purity gold, silver and copper, indeed metal of a purity unobtainable in the 18th century in Mexico." Therefore the metal is modern, and this accords with the other evidence that the whole family of Mexican bars dated in the 1740s are actually twentieth-century fakes.[10]

Numismatic Circular 98.2, Mar. 1990, p. 51. Newman had been the chief assayer at the Royal Mint in London and, after his retirement, served as editor of the *Bulletin on Counterfeits* of the IAPN.

[10] Newman's conclusion was challenged by Michael Hodder in a letter to the editor of *Spinks' Numismatic Circular* 98.6, July/August 1990, p. 205. Hodder argued that the results of an analysis of three genuine Mexican gold eight escudos of 1743-45, conducted at the Boston Museum of Fine Arts in 1975, left no room for a significant trace-element content, and that (by implication) the same was true of two Mexican bars analyzed at the same time; so that Newman's conclusion, that the metal of the bars was modern, could not stand. Mr. Richard Newman of the Boston Museum has kindly reexamined the records of the 1975 analyses, and concluded that while they "give a reasonable idea of the gold, silver and copper contents of the ingots and coins," they "provide virtually no useful information on trace elements....[I]t certainly cannot be stated that the coins and ingots have similar

THE WESTERN AMERICAN GOLD BARS

To return to the western material, it is convenient to use the global expression "western American gold bars" (although a few of the pieces are monetiform) for all of this material which has appeared in the trade beginning in the 1950s. I *exclude* the Kohler and Moffat bars and the *Central America* finds from discussion here—they will be considered later.

In the 1950s previously unknown western bars began to appear on the market. These were not additional examples of Kohler or Moffat, but pieces bearing the names of firms previously unknown as manufacturers of gold (or in a few cases, of silver) bars—Adams, Argenti, Bates, Bell, etc.—the list runs to about 50 different names.[11] This

overall trace element contents, on the basis of [these] analyses" (letter from RN to TVB, 30 Dec. 1996).

Some Mexican bars continued to appear on the market after the Buttrey and the Newman articles, e.g. Christie's New York, 20 May 1986, 139-44, withdrawn (previously consigned to Christie's London, but declined as false) = Christie's New York, 15 June 1987, 414-19, with a cautionary note, "These bars have caused considerable debate in numismatic circles and there is no consensus of opinion as to whether they are from the Mexico mint and of the period 1741-46 or not"; Stack's, 2 Feb. 1983, 185, and 8 Dec. 1993, 2515-17, where there is no indication that the authenticity of the bars had been queried.

The late Walter Breen began a draft of an article intended to establish the authenticity of the Mexican bars; it remained unfinished and unpublished. In it Breen did not address the fatal difficulty that pillar dollar inpressions appropriate to the 1770s appear on bars allegedly recovered from a wreck of 1748, except to speculate that they constitute a "revalidation" procedure.

[11] Largely, but not exclusively, attributed to California: Anonymous 1849 $10, A F, Adams, Alder Gulch, Amador/Hoard, Argenti, Baldwin & Co., Bank of California, Bates/Baxter, Bell, Blake & Agnell, Blake & Co., Boles, Cal Gold 49, California & Sierra, Carlisle, Carlton, Cloverleaf/Posen, Connor, Consd Virginia, Crown King, Diana, E C P, Eagle Mining, Empire, Gold Prince Mill, Goldfield, Gould, Gould & Curry, Gray, Hall, Haraszthy & Uznay, Harquahala, Humbert, Justh & Hunter, James King, King Webb, Knight, Leeds Mining, Meyers, Naglee, North Star Mining, Ott, Parsons, Price, Rogers & Brown, Santa Rita, Star Mining, Thorne, Tri Bullion, Union Mine, United States Assay Office, Van Wyck, Wells Fargo, and other firms represented by bars of silver, or of silver mixed with low-grade gold). For a few typical examples of the gold bars, representative of a much larger body of material, see the Plates.

kind of object naturally added a new interest to the study of western American numismatics, and to the history of the West, so that it is not surprising that they were welcomed. Though expensive they were plentiful enough to go around.[12]

The new material, however, raised real questions. Some students felt a certain disquiet when in 1964 the *Encyclopaedia Britannica* included two examples on a revised plate of numismatic illustrations.[13] The pieces in question were monetiform in one case, rectangular in the other, and carried the imprint of the United States Assay Office of Gold. The plate also included one of the false Mexican bars, as well the unique Tubac ingot, which purported to come from Arizona early in the eighteenth century. That too is a twentieth-century fabrication.[14] All the illustrations on the plate were provided by the same source which was the primary supplier of the false Mexican bars to the market. The context therefore creates some unease when one turns to the unique United States Assay Office pieces, which are of a kind said to derive from a group known collectively as the Franklin hoard—a hoard which has never been published, indeed whose very existence has never been demonstrated and whose contents are quite unknown in detail. The hoard is said to have been the source of a wide variety of previously unknown pieces which share the characteristic stamps of the United States Assay Office and Augustus Humbert. This is not the occasion to go into that particular body of material in any detail, but I think it is fair to note the association of

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[12] Nineteen bars purchased by J. K. Lilly between 1956 and 1960 were priced between $2,750 and $30,250 (Argenti), average $12,000. Among the ca. 20 bars supplied to the Bank of California by John J. Ford, Jr., for its money museum was one in its own name, purchased by the Bank in 1967 at a price of $40,000. At the Bowers & Ruddy auction on 18 Mar. 1982 (Henry H. Clifford) 29 western gold bars brought from $2,400 to $22,000, average $8,000.

[13] S.v. *Numismatics*, pl. 6, illustrations provided by Ford Numismatic Publications. The larger ingot was assigned to the collection of John J. Ford, Jr., by Don Taxay, *The Comprehensive Catalogue and Encyclopaedia of United States Coins* (1971), p. 360, 135, now in the collection of the Bank of California.

[14] T. V. Buttrey, "The Tubac Ingot," *NC* 141 (1981), pp. 136-42. This ingot is accepted as false by Breen in his incomplete notes (above, n. 10).

these examples with two known forgeries—those of Mexico and Tubac.[15]

Now on a point of comparison with the false Mexican bars, the western bars are certainly very different. No one doubts that the Mexican bars form a single family: in spite of their variations in shape and legend, they derive nominally from a single authority, and physically they form a compact group in which every bar is tied to all the others by the use of common punches. The western bars, by contrast, are extremely various, not only in size, shape, weight, fineness, and value claimed, but particularly in that they are inscribed with the names of more than 50 different issuing firms.

That is a significant difference, but the western bars also share several important characteristics with the Mexican bars.

First, the western bars are similar to the Mexican bars in form. Most are punched ingots on which varieties seem sometimes to have been consciously created by changing the punches about, although this is where you would expect a standard operation to produce a standard product.

Second, like the Mexican bars, the western bars are devoid of original documentation. That may not be of itself a weighty consideration as the firms whose names appear on the bars were largely of local importance. But that is not true of all of them—for example there are bars in the name of the Bank of California. This bank has had a noble and well-documented history and books have been written about it. But no published source, and no one at the bank, can provide any information about these bars. There is a bar bearing the name of the Wells Fargo Bank, with the serial number 7857, suggesting that a large number must have been produced.[16] Kagin argues that the one survivor shows signs of having circulated as money, so that they would not have been used just to transfer bullion. But none of the other 7856 Wells Fargo Bank bars is known anywhere, and the archivist at the bank, which has a finely documented history, knows nothing of the

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[15] One such U.S. Assay Office piece was declared to be false by the ANA Authentication Bureau (J. P. Martin, "Counterfeit 1853 U.S. Assay Office $20," *Numismatist* 107.2, Feb. 1994, p. 290).

[16] The piece is illustrated in Kagin (above, n. 1), p. 308, 1.

bars. Would we not have expected at least a hint in the historical record?

Because the documentation is so poor there is almost no literature bearing directly on the western bars. What we are told of them is found almost entirely in individual entries in the auction catalogues and is unsupported. Nonetheless some of the bars have made their way into Kagin's study.[17] There too they are described and illustrated but, in spite of the study's voluminous bibliography, the individual pieces are without supporting documentation. Walter Breen was very careful about them: of the many western bars in existence he included only 8 pieces, and 5 of those he marked as controversial.[18]

Third, the point about documentation might not matter so much, since the bars are their own documentation. If we lack the details of their manufacture and circulation, at least their subsequent history is expressed in their discovery and acquisition by collectors and their subsequent appearance and reappearance on the market. These are the details from which we build the history of any individual coin or bar, its pedigree. No one would worry if an individual piece lacks a pedigree, or when its history does not reach back very far. The record is often imperfect. But what is so curious in the case of the western gold bars as a whole is that of all these varied, apparently nineteenth-century products, hardly any has a published provenience that goes back before the 1950s[19]—quite unlike the territorial gold *coins*,

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[17] Kagin, e.g. pp. 274-79, 281-82, 284, 289, 292, 298, 308, 312, 315, 322, 326-32, 334-36.

[18] Breen (above, n. 1), 7776, 7808, 7813, 7818, 7914-16, 7951. He also questioned one of the Kohler bars, 7807.

[19] Three exceptions are known to me. A gold ingot of Kellogg & Hewston, $49.50, appeared in Elder, 13 Dec. 1929, 975, and again in an unpublished typescript Mehl list, apparently of the early 1930s. A gold ingot of Wiegand, $16.50, is included in the same list. (Two Wiegand ingots in Chapman, 21 June 1909, 986-7, were of mixed metal with low-grade gold.) A gold ingot of Hentsch & Berton was published in Stack's *Numismatic Review* 1.1, June 1943, pp. 7-8. Elder emphasized the rarity and the importance of the first of these both in the introduction to his catalogue, and in the text at lot 975; and it was specifically noted as important in *The Numismatist* 43.3, Mar. 1930, p. 176. This is good evidence of the great rarity of such items before the 1950s. I owe several of these references to Stack's.

some examples of which can traced back to nineteenth-century sales and collections.[20] The bars, which are supposed to reflect western American activity in the last century, have themselves no history.

Fourth, we can approach the same problem from a different angle, looking not at the individual bars but at the phenomenon as a whole. That is, even if the surviving bars lack pedigrees, others of the same issues might have been attested in the past but be unfindable or unrecognizable today. Certainly this is true of the western gold coins: we can easily document the phenomenon of nineteenth-century gold coinage by the firm of Baldwin—to take an example at random—through the references to Baldwin specimens in Eckfeldt and Du Bois and in the nineteenth-century auction catalogues, even though we might not be able to identify a particular nineteenth-century specimen among the Baldwin pieces surviving today. In the same vein, if we leave the actual specimens of western gold bars to one side, and look rather at the general phenomenon, we ask "Where and when did these issues appear in the nineteenth century or the first half of the twentieth?" The answer is that before the 1950s you can hardly find them at all. Figure 3, illustrating the western bars, is similar to Figure 1, illustrating the western coins. It pictures the chronology of the earliest appearance of the bars at auction, by direct sale to the Lilly collection and the Bank of California, or in contemporary reference publications. Again it illustrates not individual examples, but one by one the individual firms whose names they bear, firms such as Adams, Argenti, Bates, Bell, etc.

Figure 3 derives in important part from John W. Adams, who lists the auctions of the major nineteenth- and twentieth-century dealers up to 1975. We can take for example just one dealer, the great B. Max Mehl. He produced 116 sales over a career of exactly half a century (1906-55), and he was particularly interested in the western material. He far out-sold anyone else in the private and territorial material. Fully three-quarters of his catalogues include something in that line; no other dealer is even close to that proportion. And he had quality,

[20] Thus the Kellogg $50 coin in Stack's, 11 Nov. 1974 (Gibson), 189, which goes back to the Kellogg family itself.
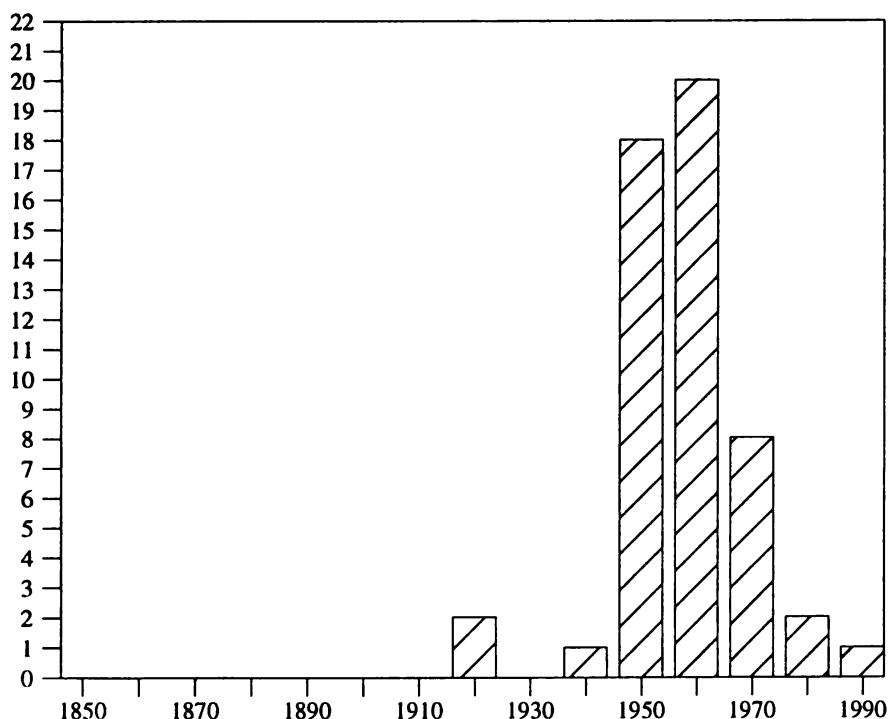
FIG. 3: EARLIEST DECADE OF APPEARANCE IN THE MARKET OF
FIRM NAMES STAMPED ON WESTERN GOLD BARS.
EXCLUDING MOFFAT AND KOHLER

not just quantity. Adams breaks down all of the hundreds of dealers'
catalogues which he lists into the various categories of material
offered, one of which is U.S. private gold. He then ranks the quality
of each category in each catalogue as A, B, or C. Not only did Mehl
sell private gold more frequently than anyone else, but Adams gives
him eleven A-rated sales (more than anyone else, with Elder being
second with eight, though he held more than twice as many auctions
as Mehl). Mehl had 42 B-rated sales, proportionately far ahead of any
other major dealer. He operated during a golden age of dealing and
collecting, and he produced absolutely first-rate material, yet in his
entire career he did not offer a single western American gold bar at
auction, and only two (Kellog & Hewston and Wiegand) in an undated
list of the early 1930s. His last sale was in 1955, just when the bars
were beginning to appear.

Mehl is a good example, but you can check the catalogues of any dealer you like and the results will be the same. Thus, to take others' auctions of as late as the 1940s, the Bell collection, sold in 1944, included great western rarities—both a Dunbar and a Dubosq, a Templeton Reid, and a Parsons. Bell had no objection to bars as he owned a Moffat bar. But he had nothing of the western material considered here. The Wharton collection, sold in 1945, had 45 pieces of private and territorial gold, but none of the new material. The Grand collection, sold in 1947, had 20 pieces of private and territorial gold, but none of the new material.[21] And so on. In short, the period before the 1950s is virtually a blank.

Figure 3 is the complete reversal of what we have seen to be the case with the western private *coins* in Figure 1. The coins produced in the West were known in the East, sometimes in just a matter of months. Yet of all of the western *bars* suddenly available beginning in the 1950s—many of which, like the Kohler and Moffat bars, bear an expressed value and are said to have circulated as money—not one is anywhere to be found for a hundred years, and this in the area of western Americana, which has been so popular and so thoroughly researched for over a century. Not only do the western bars considered here have no history, but history has none of these western bars. I cannot think of any way to explain this bizarre pattern of survival as reflecting a historical reality.

Then beginning in the 1950s there are bars in abundance. It is true, of course, that in any field of research new material appears from time to time. Over the years a few new varieties of western *coins* have come to light, e.g. the Ormsby $5, which was unknown to Edgar Adams in 1909 but illustrated by Wayte Raymond in 1931. However in the case of the ingots, rather than an occasional discovery there was virtually nothing for a century, and then in the 1950s and early 1960s they come on in a flood. Between 1956 and 1960 J. K. Lilly purchased at least 19 different bars.[22] When Henry Clifford published his survey in

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[21] Stack's, 7 Dec. 1944 (Bell), 22 Oct. 1945 (Wharton), 11 Dec. 1947 (Grand).

[22] Including Adams, Argenti, Bank of California, Carlisle, Crown King, Diana Gambling House, Eagle Mining, Empire, Harquahala, Justh & Hunter, Kellogg & Hewston, Naglee, Santa Rita, United States Assay Office [Humbert], and Weigand.

1961 he was able to include 20 pieces in the name of 16 different firms.[23]

How is it that the bars which had been unknown for a hundred years were suddenly not just available, but relatively common and so diverse? There is no documentary evidence of a huge find anywhere, and it is impossible to suppose that one ever occurred enveloping all this material, given the diversity of the bars in terms of the times and places and issuing firms claimed for them. Even the contents of the so-called Franklin hoard, whose real existence has never been demonstrated, was limited to U.S. Assay and Augustus Humbert pieces. Yet the Lilly collection, now in the Smithsonian, ultimately accumulated about 40 western bars, mostly different (as well as nine of the false Mexican bars); the Henry Clifford collection, now dispersed, came to include at least 30; the Bank of California collection includes about 20, all different. In each case most of the bars were purchased within just a few years, not laboriously assembled over decades.

To these we can add other collections which appeared on the market at auction. For example, the Gibson collection, sold in 1974, included a fine array of 76 pieces of private and territorial gold. No fewer than 11 were western bars, all different (as well as two of the false Mexican bars). Other bars have appeared since in a variety of auctions.[24]

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[23] Henry H. Clifford, *Pioneer Gold Coinage in the West* (Los Angeles, 1961), including Adams, Argenti, Baldwin & Co., Bell, Blake & Co., Bowie, Diana Gambling House, Haraszthy & Uznay, Hentsch & Berton, Justh & Hunter, Kellogg & Hewston, James King, Naglee, Ott, Parsons, and U.S. Assay Office.

[24] Some examples, mostly gold but including a few silver or mixed metal: Bowers & Merena, 4 Nov. 1985, 911; 9 Nov. 1987, 3621; 13 June 1988, 798; 14 Nov. 1988, 3373-74; 6 Jan. 1994, 1645. Bowers & Ruddy, 18 Mar. 1982 (Henry H. Clifford), 10-11, 23-25, 30, 32-34, 36-37, 47, 55-57, 73, 89, 94, 111, 178, 187-88, 215, 218, 221, 224-25, 232-33, 244, 249. Kagin 330, 16 Aug. 1983, 3728. NASCA, 6 Dec. 1978, 3148-49; 28 Apr. 1980, 2422-48, "the largest collection of Western bars and assay ingots ever offered at public auction." Rarcoa, 4 May 1978, 39. Sotheby Park Bernet, 4 Mar. 1983, 312-15. Superior, 19 Aug. 1975, 1719-20; 26 July 1979 (in Auction '79), 1739-47; 25 July 1984 (in Auction '84), 481-82; 28 Jan. 1985, 2126-29, 2131; 31 May 1987, 3164-70; 3 Feb. 1991, 3083a; 2 Feb. 1992, 3410-12. Most recently, Stack's, 15 Jan. 1996, 1281, a bar in the name of Boles (previously unlisted; the text states incorrectly that a Boles bar in silver had appeared in the

Adding all the references together I estimate that a complete corpus of the western bars might run to as many as two or three hundred pieces.

My fifth observation regards another curiosity in the distribution of the western bars. Not only do they not surface chronologically as we would expect—that is, they appear not over time, beginning in the 1850s and 60s, but late, suddenly, and in some quantity—but their pattern of physical distribution is also curious. Interest in private coinages and in the numismatics of the West has always been very lively. This is material which the best dealers and the most affluent and specialist collectors have always sought. Activity in the western gold *coins* spread over the market from the beginning. Yet when you check the limited pedigrees of the western bars you find that again and again they go back to just one source and various participants in distribution.[25] I find it difficult to understand how material so disparate and so widely sought by alert dealers, collectors, and students of the West, could have concentrated itself in this way.

Sixth and last, this is where we find that the Mexican bars and the western bars come together as they seem to derive from the same source.

In the face of this evidence it is my personal judgement that the western American gold bars which began to appear in the 1950s are false, all of them, and that they are twentieth-century fabrications contrived to appeal to our interest in the history of the American West. If that judgement is correct, the bars constitute the most elaborate fraud in the history of American numismatics. As with the Mexican bars, who made them is not known to me; presumably some of those who sold them did not know them to be false.

February 1956 issue of *Numismatic Scrapbook*).

[25] Clifford (above, n. 23): of 20 pieces listed, references to 18 were provided by John J. Ford, Jr., and Stack's. John J. Ford, Jr., and New Netherlands Coin Co.: e.g. in NASCA, 28 Apr. 1980, 2422-23, 2426-27, 2433, 2438, 2439, 2441, 2443; in Bowers & Ruddy, 18 Mar. 1982 (Henry H. Clifford), 23, 30, 55-56, 57, 89, 94, 111, 178, 188, 215, 218, 221, 224-25, 232-33, 244; all of the ca. 20 bars in the Bank of California. Stack's: all of the ca. 40 bars in the Smithsonian (Lilly collection). John J. Ford, Jr. and Stack's: gifts of additional bars in gold and silver in the Smithsonian (see Plates). About twenty pieces are designated as Ford, Clifford (i.e. ex-Ford), or Lilly (i.e. ex-Stack's) in Don Taxay (above, n. 13), pp. 357-61.

To return to the point made earlier, I have excluded the Kohler and the Moffat bars from this discussion. To be sure, questions have been raised about two of the Kohler bars,[26] and a counterfeit of the Moffat bar was reported earlier in this century.[27] But the phenomenon of the Kohler and Moffat bars is historically secure. Edgar Adams and Wayte Raymond were right all along. What Adams knew in 1909 and Raymond in 1931 is all that was known then (Kellogg & Hewston and Wiegand aside) and remains what is to be known now about western private gold coins and bars—that is, on present evidence, there were very few circulating bars beyond those of Kohler and Moffat. The author and editor of the standard *Guide Book of United States Coins*, too, have been right, in that for the last quarter-century they have declined to include the western bars in their listings.[28] Those of us interested in serious historical scholarship owe them a debt of gratitude.

To end on a positive note, it is undoubtedly true that many more bars, and much bigger bars than exist today, were produced in the nineteenth-century West. We have the testimony of Eckfeldt and Du Bois that they knew of individual Moffat bars denominated as high as $264, though the largest we know today is only $16. Our largest Kohler is just over $54; they knew them as large as $150. No doubt ingots were cast in all sizes, and the larger they were the less likely it was that they would be retained in that form, since they were the metal source for coins. But we now have the wonderful discoveries from the *Central America*, which went down in 1857 with heaven knows how many gold ingots aboard.[29] Some have now been recov-

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[26] To the $47.71 (Sacramento) Kohler bar, Breen (above, n. 1), p. 637, 7807, "Authentication is mandatory." See also the Appendix below.

[27] "Counterfeit of Moffat Bar Discovered," *Numismatist* 53 (1940), pp. 410-12.

[28] R. S. Yeoman (above, n. 5). A few of the western gold bars were cited in the *Guide Book* when they first began to appear (the editions of 1953/4 and following), but they began to be removed with the 1960 edition, and most were dropped altogether after 1970. For the details, see the Appendix below. Since 1994 the *Guide Book* has carried undoubtedly genuine western gold bars of five firms (Blake & Co., Harris Marchand & Co., Hentsch, Justh & Hunter, and Kellogg & Hunter) recovered from the *Central America*—see the Appendix below.

[29] For a circumstantial account of the disaster, the excavation, and the coins and

ered, and they confirm Eckfeldt and Du Bois in being, some of them, of enormous size. The largest that can easily be read in the published illustration is one of just over 208 oz. The largest one found is said to have weighed 754 oz. By contrast the Moffat $16 bar weighs about 1 oz.

The *Central America* bars, undoubtedly genuine, also differ in aspect from the western bars discussed above, in the careful and regular way in which the punches were applied. These were professional products.[30]

bars so far recovered, see Walter Breen, "The S.S. *Central America*: Tragedy and Treasure," *Numismatist* 103 (1990), pp. 1064-166. Many illustrations in *Life* magazine 15.3 (March 1992) pp.32-42. The illustration on p. 32 shows a group of 76 bars, said to be but a fraction of the total recovered.

[30] Of the 50-odd firms appearing on the western bars of recent origin (above, n. 11), two are represented in the *Central America* finds, Blake & Co. and Justh & Hunter. In each case the *Central America* pieces are entirely different in style and fabric from the western bars bearing their names. Thus in fabric, the Justh & Hunter bars from the wreck are carefully cast, with sharp edges and strong corners; the Lilly piece is slightly trapezoid with rounded corners. In style, those from the wreck are carefully labelled, with lettering from a relatively small font, even on a large piece; the Lilly piece is less carefully punched, with relatively large letters and figures of quite a different font. In legend, on the *Central America* bars the company logotype, reading "Justh & Hunter," is a crescent of very small letters, obviously cast as a single punch; the legend of the Lilly piece is unlike any so far seen from the wreck—"Justh & Hunter / Assayers"—and is made up simply from individual letter punches. The finds from the wreck read, e.g. "891 FINE"; the Lilly piece, curiously, "THOUS / 900 FINE." The sea finds give the value directly, e.g. "$416.72"; the Lilly piece, "COIN VAL / $80.40"—an unnecessarily explanatory legend which is not found on any of the genuine bars. There are then two kinds of Justh & Hunter bars of which only the *Central America* group can be accepted as geniune.

There is also the matter of size. The weight range of 79 western bars taken at random extended from 0.34 to 18.27 ounces plus 24.24, 24.41, and 31.10 ounces, average 5.87 ounces. Ten pieces from the *Central America* entered in the *Guide Book* range from 4.95, 12.52-36.68, and 208.10 ounces, average (without the last piece) 18.88 ounces, and 37.80 ounces with the last piece. Twenty *Central America* bars which appear to be characteristic and whose weights can be read from the bars in the illustration range from 12.52 to 232.34 ounces, average 61.06 ounces, with a much higher maximum reported. Although there is some overlap, the sea finds are vastly bigger than the recent western bars.

The heavy weights of the *Central America* ingots confirm what we already knew from Eckfeldt and Du Bois, that much larger bars were known to them than have

For anyone involved in historical American numismatics the *Central America* finds are one of the most exciting discoveries of the century. When this material is made available for study there will be much to be learned—from *real* western American gold bars.

APPENDIX

Notes on R. S. Yeoman, *A Guide Book of United States Coins,* ed. Kenneth Bressett (annual, current).

Some western bars were included with the private and territorial gold in early editions of the *Guide Book*, beginning in 1953 and accumulating over the next seven years.

6th ed., 1953/4	Kellogg & Hewston
9th ed., 1956	Blake & Agnell $23.30; California & Sierra Co.
10th ed., 1957	Parsons & Co.
11th ed., 1958	Anonymous $10, 1849
13th ed., 1960	Blake & Co. $20 (monetiform); Blake & Agnell $25.00; James King of William & Co.; Meyers & Co.; U.S. Assay Office disk; *removed*: California & Sierra Co.; Kellogg & Hewston

19th ed., 1966   All the remaining western bars, save one, were *removed* from the regular entries and segregated as "exceptional pieces," listed simply by name without text or illustration, "still under scientific research and study" (p. 244). There they remained through the 23rd ed., 1970, after which the list was dropped, and these bars have never reappeared in the *Guide Book*. As far as I am aware, no scientific research or study was ever produced to justify any of the

come down to us. The reason is clear: the large bars were a bullion source for coin and were regularly sent on to be minted. The peculiarity lies rather in the recent western bars which are relatively small. Many of these are pieces which would hardly be worthwhile dispatching to the mint except in bulk and no doubt most of them were; but they could easily be retained as keepsakes or collectors' items, as the private gold coins of California certainly were. Yet, again, while the coins survived in some number hardly any of the bars appear in the records for a hundred years, and then they surface in quantity.

exceptional pieces, although all, save the California & Sierra bar, were subsequently included in Kagin (above, n. 1) along with other western bars.

The one bar remaining in the *Guide Book* after 1966 was the Parsons & Co. piece (Lilly coll., Smithsonian Institution; purchased from Stack's). It too was dropped after the 24th ed., 1971.

It might be noted that the *Guide Book* also added two pieces to the corpus of Kohler bars, those of $41.68 and $47.71 (Sacramento), introduced in the 19th ed., 1966, and the 39th ed., 1986, respectively. Both derive from the New Netherlands Coin Co. (John J. Ford, Jr.). Breen was unpersuaded of the latter (see note 26).

Finally, in the early 1990s an additional western gold coin was introduced to the *Guide Book*, J. H. Bowie, $5, 1849. Issues by Bowie were unknown until a copper pattern for a $1 gold coin, undated, appeared in the Stickney sale (Chapman, 25 Apr. 1907, 1863). Edgar H. Adams included it in his "Private Gold Coinage,"[31] but no gold of Bowie was actually known, and no $5 denomination, until after the middle of this century.[32] Breen knew of two examples: Bank of California collection; Kagin (above, n. 1), p. 282, 1.[33] The former of these was earlier identified as in the John J. Ford, Jr. collection[34] and was sold by Ford to the Bank of California. John M. Kleeberg has pointed out that the punches for the Bowie $1 and $5 pieces do not derive from the same font (letter from JMK to TVB, 25 May 1997). In my judgment the $5 coin is a twentieth-century fantasy.

Today, the state of the private and territorial gold in the current *Guide Book*, 50th ed., 1997, is nearly what it was when the title originated fifty years ago, and what it had been previously for Edgar Adams and Wayte Raymond. Three pieces remain which in my judgement are not genuine: the two Kohler bars noted above, and the Bowie 1849 $5.

[31] *AJN* 46 (1912), p. 62.
[32] Clifford (above n. 23), under "California. Bars" [unpaginated].
[33] Kagin (above n. 1), p. 631, 7771.
[34] Don Taxay (above, n. 13), p. 357, 65.

PLATES

Some typical western gold bars, from the collection of the Smithsonian Institution, Washington, D.C., with their provenience.

	No.	Value	Ozs.
1. G. W. Bell/Adams	61	39.92	2.16
Gift of Stack's, 1986			
2. Eagle Mining Co.	56	206.50	10.00
Gift of Stack's, 1980			
3. F. G. Hoard	2192		9.74
Gift of John J. Ford, Jr., 1972			
4. Knight & Co., uniface	1725	186.68	9.70
Gift of John J. Ford, Jr., 1971			
5. Star Mining Co., uniface, 1880	232		5.28
Gift of John J. Ford, Jr., 1972			
6. Star Mining Co., uniface, 1880	237		4.35
Gift of Stack's, 1980			

ADDENDUM

After the above text had been edited for publication there appeared Q. David Bowers, *American Coin Treasures and Hoards* (Wolfeboro, NH, 1997) (hereafter *ACTH*). Its chapter 12 includes eight hoards of western gold bars, a previously unpublished survey which contradicts my claim, made in the article above, that finds of the western gold bars are unattested.

The eight accounts are detailed regarding the people and places said to provide the original context of the bars, but for the finds themselves very little information is offered. In fact, in the wide scope of *ACTH*, 22 chapters richly annotated with references from earlier histories and numismatic studies, chapter 12 is unique in citing no earlier published information on the hoards which are its subject. For all of the hoards the only source is a series of interviews with John J. Ford, Jr., and written comments and materials from him. The whole of the chapter

is a series of assertions deriving from these interviews—or from the modern auction catalogues in which this material appeared, in many cases accompanied by texts also provided by Ford—and for which there is no other evidence. As to the hoards themselves the texts are mostly vague and totally undocumented.

In the one case where the account of the hoard is not vague, the story of the so-called Franklin Hoard, it is seriously misleading (pp. 271–72). Most of this account is taken *verbatim* from the Bowers & Ruddy auction catalogue of 18 Mar 1982 (Clifford), which included several pieces of Franklin Hoard type which had earlier been purchased by Clifford from, or through, John J. Ford, Jr. An introductory passage in the catalogue notes that doubts had been raised about these pieces, but they are there accepted as genuine because of Ford's "use of. . .scientific methods" (before lot 26). We are not told what these scientific methods may have been.

In spite of the assurances of the Clifford catalogue, one typical Franklin Hoard piece was later unequivocally condemned by J. P. Martin, of the ANA Authentication Bureau.[35] Walter Breen listed several pieces from the group, deeming them all "controversial."[36] Michael Hodder, who contributed much to *ACTH*, did not take a positive stand on the coins in the Franklin Hoard: "I still do not feel confident enough in what I know to condemn or authenticate them."[37] If the coins are doubtful, the more so is the hoard from which they are said to derive.

In any case reference to the problem addressed in the Clifford catalogue is omitted in *ACTH*. Bowers' notes to *ACTH* state that "In instances in which two or more sources, each considered reliable by historians, differ from each other, such differences are mentioned" (p. 10). This is untrue for the Franklin Hoard. The lively dispute over its contents, which has been well known in numismatic circles, and has made its way into print, is never alluded to in the account in *ACTH*. Contrary views such as those of the three scholars cited above are

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[35] Martin (above, n. 15).

[36] Breen (above, n. 1), p. 616.

[37] "Mystery of 1853 Assay Office $20 may never be solved," *Numismatist* 107 (1994), p. 629

passed over in silence. The reader would never know that concerned students of western American coinage have long doubted not just whether there was ever a real Franklin Hoard, but, more fundamentally, whether the coins and bars attributed to it are themselves genuine.

For none of the other entries in Chapter 12 is there any hard evidence. The Knight bars are said to have been "buried along a stagecoach route, probably loot taken from a robbery," a colorful but unsubstantiable suggestion, repeated from the auction catalogue texts.[38] Or again, there is mention of a find of "about 15 to 20 gold bars" of F. G. Hoard, said to have been found in 1968 and acquired by John J. Ford, Jr., who put them on the market (p. 277). The circumstances of the find are not given. Eight pieces are noted as having been sold at auction (p. 278), overemphasizing their rarity: the real number is double that—to date at least 16 have gone at auction or advertized sale.[39] Some of these carry serial numbers not listed by Ford but in sequence with his. Together they total not 15 to 20 pieces, as circumstantially stated by Ford to have been the contents of the

[38] Auction '79 (Superior), 26 July 1979, 1746: "Found by Carlton Wells of Oakland, California, and friends, in June, 1965 on a bank of the Sacramento River. This ingot was most probably loot from a stagecoach or similar robbery." The same suggestion in Auction '84 (Superior), 25 July 1984, 482, and Superior, 28 Jan. 1985, 2128. Superior, 2 Feb. 1992, 3411: "'Quite possibly these were seized years ago in a stagecoach robbery,' postulates David Bowers in his sale of the *Clifford Collection* where two similar bars were sold, 'and were secreted by desperados who never returned to claim them.'. . . . Our thanks to John J. Ford, Jr., for his assistance."

[39] F. G. Hoard ingots: no. 2173, Stacks, 2 Feb 1983, 1357; no. 2174, A-Mark advertisement in *The Numismatist*, Nov. 1973, p. 2162; no. 2175, Superior, 28 Jan 1985, 2127; no. 2176, Superior, 19 Aug 1975, 1719; no. 2177, Nasca, 28 Apr. 1980, 2429; no. 2178, Auction '79 (Superior), 26 July 1979, 1740 (plate '1741'); no. 2179, Bowers & Ruddy, 18 Mar. 1982 (Clifford) 24 = Glendining, 13 Nov. 1969, 599; no. 2180; Superior, 31 May 1987, 3167 = Glendining, 13 Nov. 1969, 602; no. 2181, Superior, 31 May 1987, 3165 = Superior, 15 Oct. 1974, 444 = Glendining, 13 Nov. 1969, 601; no. 2182, Superior, 31 May 1987, 3166 = Glendining, 13 Nov. 1969, 600; no. 2186, Stacks, 16 June 1978, 693; no. 2187, Nasca, 28 Apr. 1980, 2430; no. 2195, Auction '79 (Rarcoa), 26 July 1979, 1481; no. 2197, Auction '84 (Superior), 25 July 1984, 481; no. 2199, Nasca, 6 Dec. 1978, 3148; no. 2205, Bowers & Ruddy, 18 Mar. 1982 (Clifford), 25.

hoard, but at least 30, with some numbers in the sequence still missing. And in any case the account of a hoard comes rather late in the day: if it was known in 1968 why was it not reported, if only in the auction catalogues? In all of the appearances at auction of the various F. G. Hoard bars, over a period of almost twenty years, not once was a hoard of this material mentioned in the catalogue texts.

In sum there is nothing in Chapter 12 of *ACTH* to persuade. For none of the hoards is there the independent supporting evidence which we could reasonably expect. Where there is evidence to the contrary, as with the Franklin Hoard, it is omitted. There is only one source for all of these so-called hoards, and that source has proved unreliable in the past. The observation made above in this article, that none of these recent supposed western gold bars can be traced to a documented find, still stands.[40]

[40] The assertion in *ACTH*, p. 265, n. 1, that B. Max Mehl, who never offered Western gold bars for sale at auction (see above), retained personally "a number of assay ingots" from others' collections, is again no more than an assertion. Even if it be true, if that is all that can be said of the ingots, there is no knowing what they were. They could easily have been U. S. Mint assay ingots which indeed have been known for years and which Mehl himself offered for sale (e.g. his auction of 18 Dec. 1918, 201, a gold bar of the Denver mint, or his auction of 14 Dec. 1926, 159, a gold bar of the U. S. Assay Office, New York).

REVIEW ARTICLE

CALCULATING ANCIENT COIN
PRODUCTION, AGAIN

S. E. Buttrey and T. V. Buttrey

François de Callataÿ, Georges Depeyrot, Leandre Villaronga, *L'Argent monnayé d'Alexandre le grand à Auguste*. Brussels: Cercle d'Études Numismatiques, Travaux 12, 1993.

François de Callataÿ, "Calculating Ancient Coin Production: Seeking a Balance," *NC* 1995, pp. 289–311.

The monograph is the work of three authors who have assembled the Hellenistic silver coinages, including Roman Republican denarii prior to Augustus, aiming to recover the coinage production figures issue by issue for thousands of issues over a period of roughly four centuries. Each study—Callataÿ, "Le monde grec hellénistique" (C.), Villaronga, "La péninsule ibérique" (V.), and Depeyrot, "La république romaine" (D.)—approaches the material in a particular way, but there is common ground methodologically. Callataÿ "Calculating" is a response to Buttrey (1993).[1]

The objective of the monograph is to calculate the number of dies originally used per issue, then to multiply that number by an estimate of coin production per die and determine the coinage total. The body of these totals can be mined for historical significance.

[1] T. V. Buttrey, "Calculating Ancient Coin Production: Facts and Fantasies," *NC* 153 (1993), pp. 335–52.

It must be said at once that throughout the results claimed are without foundation. The estimates of original die numbers are based on formulas of doubtful validity when the evidence is small, and the coinage multiple is completely arbitrary. V. and D. employ questionable statistical techniques. We will not attempt to respond to the alleged historical significance of the results: since the elaborate technique on which all the calculations are based are futile, the results have no meaning. The whole operation is worse than wrong, it is dangerous, insofar as it could be imitated by other scholars working in other numismatic material.

How has this kind of investigation gone so badly awry? Because the methodology is weak, but also because the authors, like most of us, want to view the coins as autonomous objects, so that calculating their quantity is no more than a matter of arithmetic or statistics. In real life every coin is the end product of a manufacturing process, and that process involves not only the details which every numismatist considers—weight, fineness, types, legends— but also (1) the organization of coin production and (2) the treasury orders which the production filled. Since both (1) and (2) are irregular in all times and places for which we have evidence, and in antiquity are almost completely unknown and unknowable, there is no way to calculate coin output for any issue even when the number of dies used is known. The only possible ancient exceptions are the very rare cases in which additional information is to hand, literary or epigraphical evidence which reveals the amount of coinage produced or the amount of metal used in a given issue, as in the case of the Amphictyonic silver.

Introduction

A general Introduction and Conclusion provide a common overview of the problem, how to work from the physical evidence of the coins, to calculate for any given issue:

1. the number of dies used originally to strike the issue; then
2. the number of coins which those dies produced; and ultimately
3. the amount of such coin accumulated in circulation at any particular point in time or space, and its historical significance.

Step 1. There is no ancient documentary evidence, and very little evidence from the coins themselves. A few Roman Republican issues were struck from dies marked with control marks which guarantee their extent, e.g. the denarii of Crepusius, for which see below. For all other issues we are faced with a problem in statistical probabilities on which a good deal of energy has already been spent. The usual practice is to identify the dies employed in the production of a surviving sample, and then to estimate the original number of dies by one of the several formulas currently available.[2] These authors have preferred the formulas proposed by Carter (C.) or by Good (D., V.), both of which are derived from the observed occurrence, within a sample, of groups of 2 or 3 or more coins struck from the same obverse die.

We agree that the formulae generated by Carter, Esty, and Good on the basis of probability theory can provide credible solutions under the right circumstances, but they are not fruitful in the case of very small samples, as in many of the issues treated here.

Step 2. To translate number of dies into numbers of coins struck we need to know the rate of coin production per die. Here, for the thousands of issues of silver coin around the Greek and Roman world from the late-fourth to the mid-first century B.C. our authors accept only one instance of such a calculation based on direct evidence from antiquity, namely the late-fourth century coinage of the Amphictionic League at Delphi (p. 10). Here there is independent epigraphical evidence which Kinns[3] set against a die count to arrive at an estimate of the amount of money coined. The result appears to lie somewhere between 23,333 and 47,250 pieces per die, on average, for this issue.

There is no comparably hard evidence for any other issue from over a thousand years of history for the whole of the Greek and Roman world, though attempts have been made to quantify the coinage per die for Greek issues (the late-fifth-century Athenian gold coinage, and the New Style tetradrachms) and Roman issues (the late-third-century

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[2] Warren W. Esty, "Estimation of the Size of a Coinage: A Survey and Comparison of Methods," *NC* 146 (1986), pp. 185–215.

[3] P. Kinns, "The Amphictionic Coinage Reconsidered," *NC* 143 (1983), pp. 1–22.

Mars/eagle gold, and most particulary the denarii of C. Annius, struck in Spain in 82 B.C.).

Given the almost complete gap in our knowledge the conclusion of the Introduction is astonishing. The text correctly emphasizes the fragility of the ancient evidence and the widely varying results of die production actually attested in medieval and modern times. Even this variety is grossly underestimated: the spread of 12,000–70,000 coins per die attested at the Royal Mint during 1874–76 (p. 9, n. 4) is as nothing compared to spread of 1 coin [!] to over a million attested for a single issue at the U.S. mint in Philadelphia. The authors themselves admit this irregularity: ". . . le nombre moyen . . . Il s'agit, bien évidemment, d'une valeur fictive étant entendue que, dans la pratique, tous les coins n'ont pas eu la même productivité, loin s'en faut" (p. 9). Yet they turn right around, against their own evidence and argument, and select a single arbitrary—"fictive"—figure of 20,000 coins per die which they then apply to every issue of Hellenistic silver. "si des études ultérieures devaient préciser ce nombre moyen, cela nécessite-rait d'adapter en conséquence les résultats mais cela ne perturberait en rien l'importance relative desdits résultats" (p. 11). But the authors did not limit themselves to relative importance; if they had, they could have worked directly from the die count since it is superfluous to multiply through by a constant. Rather they treated the calculated coin production results as absolute, and from that they have launched their pseudo-historical claims—e.g., the elaborate calculation of the size of the silver currency in Italy and Spain during the third to first centuries B.C. (pp. 92–93). But these calculations necessarily fail when a different constant provides different results.

This theoretical approach is completely divorced from reality. (1) The theory takes no account of the variety and reliability of the sources of our knowledge of the individual issues of coin. (2) It takes no account of the origin of the surviving examples, whether in each of the hundreds of issues the sample is full or slight, random or non-random. (3) It applies the Carter or the Good formula without regard to the size of the sample, though small samples deliver very doubtful results. (4) It assumes that the only significant difference between issues is the number of dies employed, i.e., that all dies for all modules of coins struck at all mints in all periods produced the same number or

the same average number of coins. This is simply false: it runs counter to everything that we know about the production of coinage in real life. The irregularity of die life is abundantly demonstrated by both medieval and modern evidence: different men working in different settings produce different results. (5) Finally, the theory compounds the general error of constant coin production per die by proposing that some meaningful average number can actually be applied, when any such number is simply a convenient guess. To pick such a pleasant figure at random is merely *Nummergefühl*, the selection of an attractive number "by inspiration rather than judgment" as Lucian says. It is fun to play with, but it cannot generate meaningful answers.

This theory does not respond to the simplest rules of logic. Even if it were possible to know the overall average coin production per die of Hellenistic silver coinage, it does not follow that that number would be remotely the same for each individual issue. Why *should* it be the same? Even if every die were manufactured and employed in the same way, so that each might be expected to produce the same number of coins, in fact some dies produce many coins, some only a few. Now assume that there is only one population of dies, a great Hellenistic barrel-full from which each issuer selected a random sample. Even if that had been the case, the specific set of dies that went into a single issue would have a different average production from the set of dies that went into another issue. The amount by which these two averages would differ depends on die-to-die variability, which we know can be huge, and the number of dies used in an issue, which is often quite small.

Take this analogy: there is a set of numbers in a hat. That set has a true average, which we do not know. You take a sample from the hat, and calculate the sample's average; I take another sample and calculate its average. Even though the hat has only one average, you and I will probably get different numbers just by the random mechanism of choosing our samples. If the spread of the numbers in the hat is wide, we would expect the individual averages of our two samples to be quite different. And to extend the analogy to the real situation, we would have to pick from different hats.

The problem of coin production per die cannot be solved, not just because the evidence for the correct "average" per issue is uncertain,

but because the very idea of *a* correct average is wrong. To impose a single average coin-production figure per die, or per issue, is simply to play with numbers. To found a study on such an arbitrary guess as if it were a genuine datum, and to compel all calculations to fit into this straitjacket, is absurd. Throughout the monograph everything is forced into the same mold, whereby the hundreds of individual issues differ from each other only in numbers of dies used.

Step 3. Since the original die totals calculated throughout the book are not consistently reliable (in the case of the Roman Republican not reliable at all), and since the "20,000" pieces per die is a fiction, none of the coin production totals calculated in this way is acceptable. It follows that none of the historical conclusions drawn from them in the studies and the Conclusion is credible.

THE INDIVIDUAL STUDIES

I. "Le monde grec hellénistique" (Callataÿ)

C. surveys the whole of the Hellenistic silver coinages beginning with Alexander to calculate dies in use and to discover the amount of metal coined. The monstrous system outlined above is applied mercilessly to each of several hundred issues. A novelty is the reduction of stater and tetradrachm dies to notional drachm dies striking equivalent value: i.e., multiply the number of stater dies by 20, the number of tetradrachm dies by 4, to get "coins/drachmes." This manipulation allows the aggregation of different denominations: "on pense arriver à des résultats uniformisés qui se prêtent à la comparaison" (p. 15). This is, of course, an error similar to the fixed "average," in that it arbitrarily imposes the same rate of output on dies used to strike quite disparate kinds of coin, the tetradrachms and the drachms.

Then ignoring his own caveat, "dans la pratique, tous les coins n'ont pas eu la même productivité" (p. 9, cited above), C. automatically converts equivalent die numbers into equivalent coin production. For example, he has estimated the "coins/drachmes" of Alexander at 39,300 (p. 15), of Lysimachus at 2,830 (p. 20). Therefore "en masse métallique monnayée, les lysimaques représentent environ 1/14ème de

la masse des alexandres (39.300/2.830 = 13,9)"—which would not remotely follow even if the die numbers were known to be correct.

Or again, "Dans un nombre non négligleable de cas, les trésors résultent d'accumulations locales. Néanmoins, on ne croit pas être fondamentalement dans l'erreur en estimant la part d'Antioche à la moitié de toutes les émissions réalisées par les rois séleucides. . . . Dans cette optique, il faut doubler les estimations proposées par Houghton pour cette période: il aurait été utilisé. . .entre 2.214 et 2.616 coins de droit de tétradrachmes. . . . Disons que. . .les Séleucides ont dû monnayer entre c. 225 et c. 60 av. J.-C. l'équivalent de 11.000 à 14.000 coins de drachmes" (p. 25). And so on, guesses piled upon guesses. The whole chapter is a sea of numbers, an illusion of creative activity. Here too we cannot accept that these fragile results produce any hard historical information. The best that one can say is that the collection of the material has been thorough, with many useful bibliographical references so that anyone wishing to approach this material differently in the future will find here a useful base from which to begin.

II. "La peninsule iberique" (Villaronga)

V. undertakes a survey similar to that of C., reviewing the many issues of Iberian silver. On the die and coinage figures themselves, the same caveats apply as above. Some of the die figures are arrived at with the greatest carelessness. "Pour les drachmes de Rhodé, le résultat de l'estimation, avec le classement de De Guadan, est de 80,2 coins de droit (D/Good) et celui établi d'après nos archives est de 125 coins. Pour les drachmes d'Emporion, le résultat de l'estimation d'après De Guadan est de 69,3 coins de droit et de 38,5 selon nos archives. Les résultats ne concordent pas. . . . Nous utiliserons la moyenne entre les deux estimations, soit 102 coin de droit pour Rhodé et 53 pour Emporion" (p. 50). Other die totals are calculated from Carter or Good, or are given as the difference between Carter and Good. The results are then multiplied by the same 20,000 pièces per die to achieve the coinage figures. Finally these are accumulated with a per annum erosion loss of 2%—completely undemonstrated—to create "Le stock d'argent monnayé par la péninsule ibérique" (pp. 70–74). The results are without any provable meaning.

Again, the chapter is swimming in numbers, but where do they come from, and what is to be done with them? The point is perhaps best made by looking at V.'s contribution to statistical methodology, the use of linear regressions to determine the number of dies in the uncounted issues. V's regressions compare the number of coins recovered in an issue (n) to the number of dies used to strike the issue (D), D having been estimated by means of Good's formula. If the points n and D are plotted on a graph and they all fall on a straight line, we might conclude that the number of coins produced is proportional to the number of dies used—provided of course that we assume that the number of coins recovered depends solely on the number minted.

Now V.'s material, the basis of his calculations, consists of all Iberian coins available to him, whether or not from hoards. As a practical matter, different issues were struck and released at different times and places, which can cause hoard composition and scattered finds to vary. There is no way to determine to what extent the spread is non-random, to know which issues are fully represented, which only partially. Thus Bolskan II-III (p. 59), where n = 147 and D = 82, n/D = 1.8. Is this low result a function of relatively low coin *survival* or low coin *production*?

A second objection is to V.'s calculation of D, the original die numbers. He follows Good's estimate, which is Esty's J1 or J2 (for the estimate of coverage) followed by K1 (to convert coverage into dies). Now Esty's formula K1 assumes that every die produces the same number of coins, which is not a good assumption (as he knows). We use J3 to get a confidence interval for C, which we convert, also using K1, to get a confidence interval for the number of dies (the number which Esty calls "k").

Now to get the coverage estimate, you need the number of singletons (that is, the number of dies from which we have exactly one coin), which V. does not provide. But in some cases it can be recovered, as Turiasu 15 (p. 62), where n = 5 coins, d = 4 dies observed. V. does not provide n1, the number of singletons, but of course it is 3: there are three singletons, acounting for three dies, and a fourth die from which we have seen two coins (thus n2, the number of varieties appearing exactly twice, is 1). From this he uses Good's formula

(Esty's J1—not J2 which is, according to Esty, "slightly more accurate for small samples") to estimate the coverage (1 − n1/n = − 3/5 = 0.4), and then K1 to estimate the original number of dies: D (which Esty calls k) = d/C = 4/0.4 = 10. If he had used J2, he would have come up with 8, not 10. That might be a significant difference; and (in using K1) he is assuming equal output per die, which we know to be unlikely.

It is not clear how V. computes the confidence interval for D; to complete his program you would expect that he would use J3 to get a lower end-point for C, and then K1 to get an upper end-point for D. But by doing that we get for C the following [printing "*" for "multiplied by", and the caret "^" for "to the power of", and remembering that "to the power of 1/2" is the same as "square root"]:

$$\text{lower end for C} = C - (2/n) [n1 + (2*n2) - (n1\hat{}2)/n]\hat{}(1/2)$$
$$= .4 - (2/5) [3 + (2*1) - (3\hat{}2/5)]\hat{}(1/2)$$
$$= .4 - .7155$$
$$= -.3155$$

and this negative result makes no sense.

The reason is that these techniques do not work with small sample sizes. It is not clear what a sufficiently large sample should be, but Esty's computer simulations assume reasonably large sample sizes, usually 50 or 100, and even then the Good estimate can easily be off by 25 or 50 dies. In cases like some of V.'s, where the sample is so small, these estimates are without value. Good's confidence intervals are supposed to contain between them the correct answer 95% of the time (Esty, 1986, p. 208). Yet in the case of Turiasu 15 an estimate of 250 dies, rather than V.'s 10, is statistically perfectly believable, in the sense that, if there were 250 dies of more-or-less equal productivity, and you took a sample of five coins, you would expect to get three singletons and a pair about 5% of the time; if 95 equally productive dies, about 10% of the time; if 45 dies, about 20%.

The column "Lim. sup." in V.'s table, p. 62—the upper ends of the confidence limit—is supposed to reflect the uncertainties in the estimation procedure, but here it does not because the estimation depends on approximations that only make sense for large samples. Turiasu 15 is

one of 93 issues attributed to the early second early first century B.C. (pp. 59–61). Of these fully half are known in no more than 10 specimens and 80% in fewer than 50 specimens. There is statistically nothing that can be done here.

The case has failed, but to follow the line of argument let us assume for the moment that the D's do make sense. Now the ratios of n/D do not fall on a straight line. So V. uses regression to choose the "best" line to describe the relationship between the n's and the D's. Consider his graph 2 (p. 104). These points do not fall anywhere near a straight line, as V. allows: "the regression is invalid" (p. 63). This is obvious from the illustration, and V. reaches the same conclusion from the low value of his R-squared (0.128).

If the points did fall on a straight line, we would have learned something, namely that n and D are proportional, so that we could use the number of dies to deduce the number of coins we would expect to find. We would still have to make some assumptions to arrive at a good estimate of D and to get from the number of coins found, n, to the number actually minted, N. But the points do not fall on a straight line, so we conclude that this approach is not going to bear fruit. This is powerful evidence for our belief that the number of coins is not proportional to the number of dies—at least, if you accept V.'s values of D.

Now the 43 n/D ratios for the second/first century material run from an unusual single high of 21.5 to a low of 0.3; half fall under 2 (p. 62). To control this broad range V. breaks down these data into two groups, above and below a dividing line of 2.2. He then does a linear regression for each of these groups separately, and observes that R-squared is higher—i.e. showing that the data lie closer to a straight line—for each of the plots separately than for the combined one. (In the graphs read n and D, rather than n and d.) But the division of the data into discrete lots is arbitrary, and methodologically circular. If you arrange the data in this way, you are almost certain to get better R-squareds, because the regression is comparing n to D. If you divide the data into segments where n/D varies only a little, you define a stronger relationship at the outset. If you took only the issue where n/D is constant, equal to a value A, for example, then those issues would form a perfect straight line. So it is illegitimate (1) to divide

the data by reference to n/D, and then (2) to observe that the individual pieces show a strong relationship between n and D. It *must* come out that way.

V. further subdivides the second lot, where n/D<2.2, into two groups, (i) those with n/D<2.2 but >1.2, and (ii) those with n/D<1.2, and obtains an even better R-squared. The same objection obtains: the subdivision has itself determined the result.

Even then, although these two groups generate very high R-squareds, of 0.988 and 0.924 respectively, they nonetheless generate quite different regression lines. With these as tools V. proceeds to estimate D, the original number of dies, for 17 issues whose dies had never been counted (p. 64, table). The predictions are quite unalike: for example, Bolskan II-III is estimated at 1,130 dies when computing it one way, 328 when computing it the other way—an enormous difference. V. chooses to use the formula that yields the smaller total because when he compares the predictions to estimates made by Good's method, that formula seems to him to be slightly better than the other (p. 65, table). But the procedure is circular: V. creates a number of estimates by means of Good's formula, uses them to run a regression, then judges whether the regression is of any use by comparing its predictions to Good's formula.

The fact is that the predictions are not very good. See again, p. 65, table: in the first instance the preferred prediction is off by nearly 100%, and the alternate predictor is even worse. Yet V. accepts its usefulness in estimating die numbers for issues who dies have not been counted.

In sum, V.'s regressions are misleading. Graph 2 is real evidence that n and D are not proportional. This evidence is distorted by breaking down the data into smaller and smaller lots on the basis of proportionality, and then claiming that proportionality has been demonstrated. Even then the new regression does not predict Good's estimates very well. This shows that it is not doing what it is intended to do. In any case the Good estimates for D depend on there being a large sample, while V.'s computation of the confidence interval also depends on equal die output, a hypothesis which can be rejected on the general evidence of coin production.

III. "La république romaine" (Depeyrot)

Depeyrot undertakes (a) to calculate the size of the individual Republican issues of denarii, and (b) to discover the wastage of coin in circulation, so as to calculate by accumulation the amount of coin in circulation at any one time.

The problem with this chapter is that everything is founded on a uncritical acceptance of Crawford's die estimates in *RRC*. "Les recherches de M. Crawford. . .ont apporté une documentation décisive. . . . Nous disposons, en effet, d'une estimation relativement fiable des nombres de coins monétaires de la République." This would be understandable, if lamentable, had the problem with the die estimates been unknown. In fact D. knew that these figures were problematical, and that their generation had been specifically criticized (. . . "des critiques pontuelles. . ."), but astonishingly he used them anyway and did not check them: "A défaut de publication sur l'ensemble de la période, nous avons admis comme plausibles les chiffres de M. H. Crawford" (p. 74 and n. 117).

D. refers to Crawford's die figures as "d"; we will use the uppercase "D" since they are the calculated original number of dies used, not just those observed. The number of coins recovered in the various hoards is "n," and the number actually struck (which we do not know) is "N." D. wants to compute the rate at which coins are lost from circulation, so he is really interested in the ratio of n:N. When this ratio is small, it means that relatively few coins have been recovered from among all those struck. If we assume that a hoarder built his hoard by taking a random sample of all coins from circulation, then issues with a small ratio of n:N are those for which a small percentage of coins struck remained in general circulation. This assumption might be credible if you believed that all coins circulated evenly in all places. But this is not necessarily the case, as is indicated by the obvious fact that the profiles of different hoards from the same period do vary.

In any case D., not knowing N for any of the issues, uses Crawford's D figures instead, and follows Crawford in assuming that the average number of coins produced per die in every issue is a constant. This is not quite to assume that every die struck exactly the same number of

coins; rather, that the set of dies for year 155 had the same average production as the set for year 154, and for 153, and so on.

D. then submits his data to a regression analysis to determine annual rate of loss. Before turning to the mechanics of his regressions, what does a 2% loss (say) per year indicate? Consider the hoarder who put together the Riccia hoard in the year 125 B.C. He gathered up all the coins he could get his hands on and stuck them into a receptacle. From all the coins minted in 154, there were relatively few, compared to the proportion of all the coins minted in 126, because of loss.

Now, suppose we knew the number of coins minted in each year, and suppose the 2% loss per year were true. Then we could construct the population of coins available to be hoarded in the year 125. That population of coins would consist (approximately) of all the coins from the year 126; plus all the coins from 127, less the 2% lost by wastage, for a total of 98% of the coins from 127; plus all the coins from 128, less 2% lost in 127 and 2% of the remainder lost in 126, for a total of 98% of (98% of the coins from 128); and so on. In each year, we hypothesize that 2% of the available coins are lost, and these losses mount the way compound interest mounts.

Of course, we do not know that 2% is the right rate; we do not even know if there is a single rate: perhaps the rate of loss differs from year to year. But if there were a single number, call it "l" for loss. To find out how many coins from last year made it to this year, you would multiply by (100% minus l). In the above example, the loss is estimated at 2%, so each year's number of coins is multiplied by (100% − l) resulting in "k" for "keep." So every year, we compute the number of coins available by multiplying last year's counts of available coins by k, and then adding in this year's new coins.

To put it visually, let N(155) be the number of coins minted in the year 155, N(154) be the number struck in 154, and so on. Then we have this ("ˆ" means "to the power of"):

Year	N, coins minted in that year	n, coins available to hoarder from that year	n, if N = 10,000 and k = .98
126	N (126)	N (126)	10,000
127	N (127)	N (127) times k	9,800

128	N (128)	N (128) times k^2	9,604
129	N (129)	N (129) times k^3	9,412
⋮	⋮	⋮ ⋮	
⋮	⋮	⋮ ⋮	
154	N (154)	N (154) times k^28	5,680
155	N (155)	N (155) times k^29	5,566

Implicitly part of D.'s position is that the ratio of the number of coins recovered to the number of coins available to the hoarder (the last column above) would be constant. That is, the hoarder collects perhaps 1/100 of 1% of all the available 155 coins, and 1/100 of 1% of all the available 154 coins, and so on. If this is not true—if, for example, the coins differed in their attractiveness to the hoarder—then the number recovered, n, would be a poor guide to anything.

Taking all the ratios of n to N, one for each year, and plotting them on a graph, you would expect the line to be curved, growing slowly at first, then quickly. You can see this easily by assuming that all the N's are about the same (fourth column, heading); then the number recovered should depend just on the number available. The numbers in the fourth column do not follow a straight line; the difference between the two oldest issues is smaller than the difference between the two newest ones.

D.'s assuption, however, is different. He does not believe that the losses compound, but rather that each issue loses about the same number of coins—rather than the same percentage—every year. If we thought that there was a constant annual percentage loss, Depeyrot's regression would not be a good analysis.

Depeyrot's Regression.

D.'s regression differs from that of V's. V.'s regression had compared the number of coins recovered in an issue (n) to the number of dies used to strike the issue (D), whereas D. does a regression of the ratio n/D against time, to calculate the slope of that straight line. (We have shown that we would not expect that line to be straight, if there were a constant percentage annual loss.)

D. believes that the ratio of n/N (or his proxy, n/D) should be small for old issues and larger for newer ones. We agree. He thinks that the set of ratios ought to fall on a straight line; we think that even if there were a constant percentage loss from year to year (which we do not know), the line would be curved. He also believes that it makes sense to use Crawford's D's in place of the unknown N's. We do not agree.

But we follow D.'s rationale. He computes the ratio n/D for each issue in six of Crawford's hoards, plots them on a graph against the year of issue, and then uses regression to find the "best" straight line that fits that set of points. He needs to do this separately for each hoard, since the actual number of coins recovered—and indeed the profile of the finds—differs from hoard to hoard. Without explanation he divides both the Monte Codruzzo and the San Giuliano hoards into two segments.

Interpreting the Slopes.

First, given that the ratio of n/N should be smaller for older issues and larger for younger ones, the line of D.'s graphs of n/D against time ought to rise as we move to the right (forward in time), even if we do not know how to connect N and D. But D.'s slope for the second half of the San Giuliano hoard is negative (and, had the arithmetic been correct, the result would have been negative for the first half of San Giuliano as well). A negative slope makes no sense at all: it means that there is in time a *growing* proportion of older coins still in circulation. Either some other, unknown factor is at work, or the data are so full of noise that the conclusions are nonsensical—observe how the graphs jump around.

Converting from Slope to Annual Loss.

For each hoard, then, D. creates a regression and takes the slope of the regression line, which is really the result of interest. For Riccia, for example, his slope (which he computed after rounding) is about .34 (graph 1, p. 107); that means that the change in the ratio of n/D is about .34 per year. He calls these ratios of n/D "percentages," but they are not percentages of anything as they could well be over 100%.

But D. then reports for Riccia that "[we can] compute an annual loss of 0.64% per year" (p. 78). What is the source of this number? It does not appear on his graph 1, nor does he explain how he arrived at it. We are unable to move from the reported slope of each of the other hoards, in each case asserting a calculated rate of loss. These numbers will be fundamental to his later assertion of a per annum loss of 2%, yet none of them appears in the tables or the graphs, and there is no indication how the calculations were achieved. Furthermore they do not make sense on the face of it: the slope for the first half of Monte Codruzzo is less steep than that for Riccia, yet his alleged "annual loss" is higher for the latter.

Combining the Slopes

The situation is even worse than that. D.'s alleged annual rate of loss for his eight graphs are all over the place, ranging from a high of 7.02% to an impossible negative of −1.00%. The range itself is evidence that these procedures are not producing any useful answer. But D. simply averages them all together (assigning 1.44 to Alvignano though 1.50 in text): the result is 1.80 including the negative value, 2.20 excluding it. But D. arrives at 2.05%—"Nous sommes donc amené à retenir la valeur de 2% comme taux annuel de perte de monnaies."

The arithmetic is wrong and there is no statistical justification for taking the average of a group of regression slopes. Two basic questions to ask are: "Why are there such disparate results?" "Do the data of a particular hoard depend on the randomness of the sample?" If it were possible to answer the questions we might then discover whether it makes sense to combine these slopes.

D. began with flawed data; made bad assumptions (D as a proxy for N), and applied an inappropriate model (that the ratios n/D should fall on a straight line, that the slopes should be the same from hoard to hoard). He has made errors in the computations, has used some incomprehensible and unexplained maneuver to arrive at a percentage loss per hoard, and then has combined these losses in an illegitimate way.

CONCLUSION

Of the three essays D.'s is hopeless: the data deployed are literally meaningless and their statistical manipulation is full of errors. The other two essays—C.'s and V.'s—usefully collect the material and generate figures for the population of dies per issue, though the results for the smaller die populations are not necessarily reliable. Even so, relative die totals alone do not guarantee relative intensity of striking, and no die number can be made to produce the hard figure we most want, the number of coins struck.

That number cannot be deduced solely from the numismatic data. We have seen that the average coin production figure used throughout the essays, of 20,000 pieces per die, is entirely arbitrary. Any single number implies a constant production level per die over endless time. This is simply impossible on all the evidence that we have. It follows that the coin production totals offered throughout these essays are baseless.

That the whole procedure is corrupted by the appeal to an arbitrary "average" was revealed early on in *L'Argent monnayé*. A calculation of the silver production of Alexander, Philip II, and Lysimachus, based on an "average" of 20,000 coins per die, produced the result of 170,433 talents. "On n'oubliera . . . qu'une estimation différente de 20.000 exemplaires par coin entraînerait des resultats sensiblement différents. [Fn.] A titre d'exemple, on obtiendrait un résultat de 85.217 talents pour une estimation de 10.000 exemplaires et de 255.650 talents pour une estimation de 30.000 exemplaires" (p. 16). Yes, and one can guess at as many other averages as one wishes, resulting in that many different additional results, all equally unreliable.

IV. "Calculating Ancient Coin Production: Seeking a Balance" (Callataÿ)

In "Calculating," Callataÿ turns to some points raised by Buttrey.[4] His subtitle, "Seeking a Balance," implies some sort of middle way

[4] T. V. Buttrey, "Calculating Ancient Coin Production II: Why It Cannot Be Done," *NC* 154 (1994), pp. 342–52.

between the position that ancient coin production cannot be quantified (Buttrey) and the assumptions, such as appear in the monograph under discussion, that it can. To begin C. addresses the examples of the cistophoric tetradrachms, arguing that the calculation of original numbers of dies used coincides *grosso modo* with the number of coins found. Such a correlation may be true in this case; it may even be meaningful, in suggesting that similar methods of coinage applied among the cistophoric mints; it is not necessarily true generally. But let all this be granted for the argument. C.'s figures do not reveal the level of production. If the cistophoric dies produced 100 coins each, or 1,000, or 10,000, or 100,000. C.'s result would be exactly the same.

None of this gets us any closer to the central question, how many coins were struck for each of the cistophoric issues? The answer to that is provided in *L'Argent monnayé* simply by artificially multiplying everything by an "average" of 20,000 coins per die, giving a result which has no demonstrable connection with reality. "The so-called 'average' is without foundation" (Buttrey 1994, p. 349), and that continues to be true, so that no calculation of coin production based on it is credible.

C. may well be right in feeling that we can learn something by rejecting extrapolations and working more directly with die counts and hoard survivals. Perhaps the hoards themselves are the best evidence after all. Certainly no one has ever doubted that issues which regularly occur in the hoards in large numbers were originally of larger extent than those which occur in small numbers. The problem comes in refining the evidence more exactly, since every hoard has its eccentricities.

But let it be allowed that we will some day be able to describe the "normal" or ideal hoard, to which all real hoards stand in closer or more distant relationship; and that therefore the relative relationship of size of each individual issue to every other issue will finally be established. We still will not know for any of them what we really want to know, which is the original size of coin production.

C. is sterner than most in doubting the usefulness of any published calculation of ancient coin production based on documentary evidence except for Kinns' on the Amphictionic silver. But in "Calculating" C.

has carefully assembled an interesting array of such cases from medieval and modern times. These are of course only a few dozen examples from untold thousands of issues over half a millennium, but C. is impressed that with some exceptions the average coin production per die per issue (which is not at all the same as actual coin production per individual die) tends to cluster in the area of 20,000-45,000 pieces.

This still tells us nothing directly about ancient usage and pruduction. However, "the number of 30,000 coins per die as a average [here he is averaging averages] would appear to have some justification for silver of the medieval or early modern period. . . . I believe that in the absence of other evidence it can provide some guidance, especially when this average is consistent with the only piece of evidence we have for Greek coins (the Amphictionic coinage)" (p. 300).

In other words, we have the appropriate information for *one* issue of ancient Greek coins out of thousands, and it seems to be parallel with a fragment of evidence from 1,500–2,000 years later—both in the area of 30,000 pieces per die. We are therefore supposed to be justified in using this figure for all ancient coinages. Some of us will find that a very weak reed to lean on. Furthermore, this figure of 30,000 is 50% above the figure actually used by C. and his colleagues in *L'Argent monnayé*, whose results would have to be emended to this large extent.

C. goes at the problem from still another angle, estimating the amount of time needed to strike (number of days, number of working hours in the day) and multiplying by the speed of striking. Here too there is only guesswork: who is to say how any mint was organized, and why should we suppose that the same usages applied generally? Why assume that production was always steady? P. H. De Ruyter's die study of the denarii of Bursio ("The Denarii of the Roman Republican Moneyer Lucius Julius Bursio, a Die Analysis," *NC* 156 (1996), pp. 79-147, esp. p. 115.) shows very interestingly that the dies with similar control marks tended to be used in clusters with a good deal of internal linking, while the clusters themselves, of dissimilar die marks, tended to be only thinly connected externally to each other. This is good evidence that Bursio's production was sporadic, as indeed is the fact that the intensity of output of the Republican moneyers in general is so different one from the other, as is proved by their widely varying die counts and the differential survival of their coins. Any

results derived from suppositions about the working day, speed of striking, and regularity of production are baseless.

Turning to the problem of hoard survivals and attrition over time, C. points to studies in velocity of circulation and weight loss through use. This is not the same point raised in Buttrey 1993, 1994, and that may be our fault. The terms "attrition" or "erosion" were meant to indicate cumulative wastage of the coins over time through loss, hoarding, export, melting, etc., not weight loss of individual specimens through handling. It may be that loss is to an extent a function of velocity—the more frequently a coin changes hand, the greater the likelihood that it will be lost. But it is hard to see how that can be measured, and velocity can hardly explain the total disappearance of an issue from circulation. On attrition, "[Buttrey] writes: 'There is no ancient evidence at all'. This is not true since the study of hoards can help us very much to determine what has disappeared and what is still in circulation." So it can, but the point was that the study of the level of survival or non-survival in disparate hoards cannot generate a single figure for wastage in ancient circulation, since wastage, even if measurable, must in practice have been a variable.

Volk[5] has looked at this problem in some detail (pp. 178–89). He graphs the decline over time of several issues of Republican denarii, and speculates on the several possible reasons for wastage. What is clear is that different issues survive at different rates (although this might be to some extent a function of the selection of hoards in *RRC*, on which Volk's figures are based). He concludes that the "best fit" for the issues which he has considered is a wastage rate of 2.75–3% per annum. This is equivalent to an average, which may indeed apply to a wide spectrum of Republican coinage taken as a whole, but cannot be used on present evidence to quantify the loss of any particular issue, given individual variation.

This question of averages is the nub of the matter. C. has still not understood the points raised on the other side, and perhaps they were not clearly put. He objects (p. 305) to the statement "If 30,000 [coins

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[5] T. R. Volk, "Mint Output and Coin Hoards," in G. Depeyrot et al. eds., *Rythmes de la prodaction monétaire* (Louvain, 1987), pp. 141–221.

struck per die] is the wrong number, will we not at least get usable results with the right number? No, there is no right number." Well of course there was an original total of production per issue; that is what we are trying to find. The objection to the imposition of the so-called "average" is that *all* such figures are equally baseless. It is pointless to reject 30,000, which has no foundation, for some other number, because no other figure is any firmer. The true figure, the original total, cannot be gained by guessing at an average.

Those who in the recent past have presented results alleged to represent total original production of Greek and Roman coins have done so by abusing the term average. The term signifies the mean of a set of two or more numbers: *OED* s.v., "The distribution of the aggregate inequalities of a series of things among all the members of the series, so as to equalize them, and ascertain their common or mean quantity." If you do not have the series, you cannot derive an average. To calculate the average coin production per die of any issue you have to know (1) the number of dies originally employed, and (2) either [a] their individual production, or [b] the total production of the issue. For any die-counted issue we can estimate part (1), the original die total, from one of a number of statistically based formulae. But we do not know either (2[a]) or (2[b]) for any issue of ancient coins, except for the tiny number of issues like the Amphictionic silver where there is additional literary or epigraphical evidence.

The most extraordinary of C.'s assertions comes here (p. 306): "True. . .: you cannot rediscover the individual variations if you know only the average. But it does not matter here since we are interested in the average, not in the individual varieties [?? this is precisely the operation of *L'Argent monnayé*, where the "average" is imposed backwards on the individual issues]. Buttrey seems to reach the strange conclusion that, given that the data vary. . ., it is meaningless to propose an average. The contrary is true: it is precisely because the data vary that we have to construct averages."

Every average is a calculation. This is a simple arithmetical definition and should never have been misunderstood by anyone. How can you "propose an average," or "construct an average" when the set of data is not there in the first place? If I wish to average four numbers—3, 6, 9, 12—I add them and divide by the number of

items: 30/4 = 7.5. If I know that there are four numbers but I do not know what they are—a, b, c, d—how do I "propose an average?" This is an absurdity. "To propose an average" simply means "to guess at any attractive figure," hoping that it is somewhere near the number which would have resulted had we had the missing data. Since the final result of the operation will be the coin production figure we were looking for, this is equivalent to saying, "If we don't have the evidence, let's just propose the answer."

Reece believes that it is possible at least to approach the right answer: "Every count and every calculation ever done is to some extent wrong; what matters is not the error (which is inevitable) but its extent, which can, and should be quantified. This can be done immediately by insisting on a limit of error (+/−) being attached to all estimates" (*JRA* 7 (1994), p. 488). This is wishful thinking, and no advance at all. If you do not know the value of a, b, c, and d, how can you establish the limits within which their average falls, the "quantifiable error"? By what criteria can we judge whether the limits set by anyone are meaningful? It would have been more persuasive had Reece illustrated his claim with an actual example.

Similarly, actual cases are wanting in "Calculating." While deploring what he sees to be the pessimistic view, and seeking a balanced position, C. does not himself take the opportunity to calculate the production of any ancient issue to show how it can be done; he can only recommend guessing our way to an answer which can never be verified even in the broadest terms. His encouragement to the creation of more die counts is positive; they would doubtless give us a much better sense of the relative size of issues. But you can count every die ever used, and disinter every hoard ever buried, and you will still be not one step closer to solving the central problem which excited all this activity in the first place: How many coins did this moneyer strike, or that one, or all moneyers, or this Hellenistic mint, or that Imperial one? You have to know more than just the number of dies used and the number of coins surviving.

In the end there is no balance here, no middle way. The data are not there. Either you confect your own and pray that they might be right (thought you have no way of knowing whether they are or not),

or you admit that this is a problem which cannot be solved on present evidence.

If anyone still believes in this process, let him solve the following problem. We know the coinage of Crepusius more thoroughly than that of almost any other Roman Republican moneyer. The corpus of surviving specimens, earnestly accumulated from public and private collections great and small, and from the auction market, runs to just over 2,300 pieces. The obverse die count is virtually certain since the seriation of die marks is clear, the total number of dies coming to ca. 478, within half-a-dozen either way.

Now, following Reece's suggestion we can set minimum and maximum limits of error to which everyone will agree. The minimum number of coins struck is 2,300, the number currently surviving. For a maximum, consider the U.S. Mint at Philadelphia, where numbers of presses working day and night produce an endless stream of coin, an annual production of several billion coins a year. Let that provide the maximum. No one would deny that the total of denarii struck from Crepusius' 478 obverse dies fell somewhere in the range of 2,300 to 5,000,000,000. This is an undoubted fact, of no utility at all. To get close to any reasonable answer the range must be narrowed drastically, but how is that to be done when no other data are to hand, and no mechanism exists for the estimate of more plausible limits of error?

Let this problem stand as a challenge to anyone who believes that the correct Crepusius total can be even generally approached without fantasizing (e.g. multiplying 478 dies by an arbitrary 20,000 or any number which you happen to like). If it can be solved we are on our way to quantifying many other issues, Greek and Roman. But if it cannot, then no issue of ancient coin can ever be quantified simply from the data of numbers of dies used and numbers of specimens surviving. That is why *L'Argent monnayé* is so completely misaimed.

BOOK REVIEWS

Frances Van Keuren, *The Coinage of Heraclea Lucaniae*. Rome: Giorgio Bretschneider Editore, Archaeologica 110, 1994. 100 pp., 25 pls. ISBN 8-87689-108-0, ISSN 0391-9293. No price stated.

The last few years have seen a welcome increase in the number of monographs published for the coinage of south Italy. Campania has been covered by N. K. Rutter's *Campanian Coinages 475-380 B.C.* (Edinburgh, 1979) and by the proceedings of the seventh Naples convegno *La monetazione di Neapolis nella Campania antica* (eds. A. Stazio and M. Taliercio Mensitieri, Naples, 1986). For further south we have had the two volumes by A. Johnston on the coinage of Metapontum (S. P. Noe, *The Coinage of Metapontum*, pts. 1 and 2, additions and corrections by A. Johnston, and pt. 3 by A. Johnston [New York, 1984 and 1990]), R. R. Holloway and G. K. Jenkins, *Terina* (Bellinzona, 1983), and R. T. Williams, *The Silver Coinage of Velia* (London, 1992). Between them these books cover much of the coinage of southern Italy, and they have now been joined by Van Keuren's monograph on another of the important coinages of the area, that of ancient Heraclea (modern Policoro).

The early staters of Heraclea were the subject of Eunice Work's *The Earlier Staters of Heraclea Lucaniae* (NNM 91, 1940), but Van Keuren's work covers the whole of Heraclea's output, the silver (and extremely rare gold) coinage from the fifth to the third century B.C., and the bronze from the third to the (second or) first century B.C. The book is fairly traditional in approach (although the inclusion of the fractional silver and bronze coinage is a very welcome departure from tradition). A historical introduction precedes a discussion of the evidence for the classification of the coins. This is followed by a descriptive catalogue of the different varieties of the coinage, and a

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specimen of each is illustrated on the plates. The catalogue is, however, not a full die study, but rather a type catalogue of the different varieties, so the illustrations are not sufficient for die comparison (I am not sure that the quality of the plates would always have been good enough anyway). This lack can, however, be remedied for the earlier silver by reference to Work's book, and Van Keuren promises a future publication of a mint study of the later pieces (now published in *The Age of Pyrrhos*, ed. Hackens and Holloway, which is dated 1992, although it appeared only in 1995).

So the book is not intended to be a mint study, but an overview of the coinage rather like Holloway and Jenkins' *Terina*. Indeed Van Keuren's book is modeled on *Terina*, as their very similar format makes clear, and in this aim it seems to succeed well. For the earlier period, the author has been able to supplement Work's material. Sometimes she has changed Work's order, although the reasons are not always clear; nor indeed is it clear whether or not she regards the order she gives of different varieties within a particular group as a chronological sequence. The chronology Van Keuren gives seems plausible, based principally on coin hoards, which are sufficiently numerous to give a good idea of the dating relative to that of other south Italian mints like Tarentum or Metapontum, whose chronology is well established. She never gives a very detailed chronology and uncertainties remain, such as the classification of the silver diobols, the date of the rare Heraclean pegasi (her 78, where a reference to Kraay's several publications on the pegasi would be more useful than the citation of Head's *Historia Numorum*), or the date of the end of the silver coinage. Her earlier view was that the silver ceased at the end of the Pyrrhic War, but she now thinks that it continues "at least to the middle of the third century" or perhaps even "beyond" the middle (pp. 44 and 46). Although I would be the first to admit that the evidence for the chronology of Italian coinage in the middle of the third century is not at all good, it still seems to me more likely that it ended earlier rather than later. In the case of the ending of the bronze coinage, I would have thought that the single relevant hoard suggests that it ended in the late second century B.C. The hoard seems to me to be more reliable evidence than any a priori attempt

to tie the end of the coinage to the change in Heraclea's status during the early first century B.C.

On several occasions in the book Van Keuren looks for artistic parallels for the coinage and offers historical interpretations of the designs used. The former are often interesting (e.g. the idea that the head on 83-87 is derived from Alexander the Great's gold staters), though not always convincing (e.g. the view on pp. 25-26 that changes in the pose of Athena may be derived from the influence of contemporary wall painting seems somewhat speculative, and can we really believe [p. 27] that coins of Mallus in Cilicia copy coins of Heraclea?). One could also perhaps have found much useful material in the relevant volumes of the *Lexicon Iconologicum Mythologiae*, although they may have appeared too late to have been used by Van Keuren. The attempt to find historical references on the coinage is hampered, as often with other south Italian coinages, by our enormous lack of knowledge of contemporary events. We also have to decide whether some features, e.g. the appearance of a Nike, are so generic that it is wrong to read anything into them, and whether we accept (as Van Keuren does) that we can follow the political interpretation of the symbols that occur on south Italian coins (as symbols of, e.g., Alexander the Molossian or Pyrrhos).

This book should not be judged for what it does not set out to be: it is not a full mint study, nor does it cover in any detail other questions, such as the volume of coinage produced or the relations between Heraclea and other mints like Tarentum. The book contains information that is new and welcome (e.g. the discussion of the late bronze coinage). It gives a clear idea of the shape of the coinage of Heraclea, and of the reasoning behind the classification.

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Blanche R. Brown, *Royal Portraits in Sculpture and Coins: Pyrrhos and the Successors of Alexander the Great.* Hermeneutics of Art, vol. 5. New York: Peter Lang, 1995. 121 pp., 48 pls. ISBN 0-82042-577-X. price?

In the introduction to her study on a particular period of hellenistic portraiture, Brown states her twin goals for the book, a study of the

head identified as Pyrrhos in the Ny Carlsberg Glyptotek in Copen-
hagen and the style of royal portraits of the era immediately following
the death of Alexander.

The author begins with a discussion of the head (chap. II), assessing
the reason for assigning it the identity of Pyrrhos (chap. III)—basically
because it wears an oak wreath, which is considered appropriate to
Pyrrhos. Most art historians agree with Brown on the identification,
although R. Winkes does not (in T. Hackens et al. eds., *The Age of
Pyrrhos*, 1992, listed in Brown's bibliography, though the article
seems to have been unavailable to her). One of the problems in identi-
fying the head is that it is assigned to the category of the Pergamene
"baroque" style, a style more typical of the first half of the second
century B.C. than of the third century B.C. The argument is that
Pyrrhos's successes were confined to such a short period in the late
fourth/early third century that it is unlikely that his portrait was
copied in the second century, but the copy was made when a Roman
patron was filling out his "list" of hellenistic kings. Compounding the
problem of a secure identification of the head is the fact that the
Macedonian kings of the third century did not place their portraits on
their coins, which means we have no direct comparison between
contemporary coin portraits and the head argued to be Pyrrhos.

In her following chapters Brown seeks to identify the "dramatic"
style on coins and sculpture of the late fourth century (chap. IV), the
coins of the successors of Alexander (chap. V), and the coins of the
post-successor generation (chap. IX). She devotes a short chapter to
proving that the head is not part of the Pergamene "baroque" style,
removing a support from those who would date the original to the
second century, and re-emphasizing her view that the original must
have dated to the late fourth or early third century (chap. VI, also
p. 2), a preliminary (as she constantly stresses) study on the other
portrait styles available to artists (chap. VII), and a chapter on royal
portrait sculptures of the "dramatic" style (chap. VIII). Her biblio-
graphy is broken into three parts: a list of general sources for the helle-
nistic period; a shorter list of historical sources for the hellenistic
period; and a specialized bibliography of portraits and numismatics of
the hellenistic period. Although this separation makes the reader work
harder to find references in Brown's footnotes, the bibliography is

fairly complete and should be useful to the student or researcher using her text.

The study of hellenistic portraits has been invigorated by several recent treatments of the subject, especially R. R. R. Smith's *Hellenistic Royal Portraits* (1988) and A. Stewart's *Faces of Power* (1993). Brown joins those interested in applying what we know about numismatic portraits to the surviving free-standing portraits (see also N. de Chaismartin, "Eumêne II de Pergame: du type monétaire aux portraits plastiques," *REA* 95 (1993), pp. 225-34, not cited in the bibliography). It is worthwhile to evaluate the strength of her numismatic arguments.

Brown finds the first use of the "dramatic" style on coins of Alexander issued at Alexandria, with the head of Herakles (pp. 22-23), a style which was taken up by Ptolemy I in 318 (p. 22). It is important to Brown to find the first die of the series in order to discuss the intentions of the creator of the portrait. This die should reflect the official portrait (e.g., pp. 8-9). Smith (above, p. 3) has suggested that our confidence in finding royal portrait types on coins is severely misplaced. Brown is of the opposite mind, believing that coin types are an important means of tracing portrait styles. Hence she finds that as the Ptolemaic series develops, the style becomes less dramatic in Egypt, but finds a home in rare double darics of Seleukos I made in Ecbatana (ca. 300 B.C.), possibly by local die cutters working from coins of Ptolemy I (p. 27). Apart from the Ptolemaic and Ecbatana mints, the dramatic style is found on coins minted by Lysimachos in Lampsakos ca. 297/6-282/1 (pp. 30-31) and Demetrios Poliorketes in Amphipolis (ca. 295 B.C.). The style is delineated by higher relief, richer modelling, and more intense chiaroscuro, especially in the wildly tousled hair. After these five ruler portraits, the style begins to die out, being seen only in the posthumous coins of Seleukos I (p. 32), and fading in the copies of Lysimachean heads of Alexander and posthumous portraits of Ptolemy I (pp. 34 ff).

I am not as certain as Brown that the first die of the series will present the viewer with the best example of the official, preferred portrait style of the ruler. If the first die in the double daric series was the preferred style, then very few of the Ecbatana coins follow the preferred style; the dies that are in the dramatic style show a wide variation in facial type (see, e.g. ACNAC 4, 1983, nos. 1120-33).

Unless the Greeks were employing hubs, each die should be a unique creation, modeled by one or more artists in a style that may (or may not) have been decided by the mint officials, but clearly showing their hands in the finished die. Thus a die cutter who could successfully capture the dramatic style in one die might easily do so again for the second die he makes—or even capture the style in a more profound way, since he had tried it once already. We do not have to assume that the second die would be made by a lesser cutter copying from "the master die." But this is a side issue.

Brown herself admits that the first objection to her argument will be that the dramatic style does not appear on sculptured portraits at the time of Pyrrhos. Her answer is that she can find the beginning of the style in sculptured heads from the fourth century and that the style is developed on coins of the third century and merges with the "baroque" style of the second century (p. 31). Portraits of some third century rulers do exist and should provide the parallel she needs to complete her argument. For instance, Demetrios Poliorketes is known through one bust (which is argued by Smith [1988], p. 71-72, to be a close copy of a third century original) and one statuette in the Villa Papyri, yet the dramatic style is so downplayed that Brown does not offer the bust as a example of the dramatic style. She does make the parallel, which is often made, between posthumous coins of Seleukos I and the Villa Papyri bust, since both are done in the dramatic style (p. 61). Yet the date of the original portrait is disputed. Also problematic is the date and style of the marble head of Ptolemy I, now in Copenhagen, and the bronze head in the Prado (pp. 62-64) which she cites as further examples of the dramatic style. These are the backbone of her argument that the dramatic style was found in sculptured heads of the third century.

Brown's final argument is that the Pyrrhos head is a style distinct from the baroque style; her intent is to prove that the original of the Pyrrhos head should date to the third, and not the second, century. As in the discussions on the heads of Ptolemy I and the Prado head, there is some room for disagreement when discussing stylistic nuances. I am not as ready to discard completely the connection to the baroque style as Brown is. It would be interesting to discuss the Pyrrhos head as a Roman copy, and valuable in itself as a measure of Roman art, the

approach especially advocated by B. Ridgway (e.g. *Roman Copies of Greek Sculpture* [1984]). Could the copyist have "toned down" the baroque force of the original to make the head more compatible with the rest of the series commissioned by the Roman collector? Was he a sculptor who did not like or could not capture the baroque style? Or was his model so removed from the baroque original that he could not restore the baroque qualities to the copy he produced?

What is clear from the book is that there was a wide variety of styles from which the patron or artist could chose, and in this Brown agrees with Smith, who had also argued against a linear evolution in the development of style. Brown discusses in passing the Schlichte ("Plain") style (pp. 36-37), the "Realistic" style (p. 36), and the "Classicistic" style (pp. 39 ff); she develops her argument with the "Baroque" style, while proposing her thesis on the "Dramatic" style. It is helpful to have her examination of one of the lesser-discussed styles. And it helps to place coinage in the forefront of the discussion on portraiture. Coins have long served as handmaidens of the historian and art historian, but need to be looked at seriously as pieces of art in themselves, as Brown emphasizes. Crucial to her argument are the abundant and clear photographs. Obverses of coins are displayed as both 1:1 and enormously enlarged to help the viewer see the details that Brown is so good at noticing and writing about in a clear, helpful, and stimulating way. The book should appeal to students of the ancient world and should find a place in college and university libraries.

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Kenneth W. Harl, *Coinage in the Roman Economy, 300 B.C. to A.D. 700*. Baltimore and London: The Johns Hopkins University Press, 1996. x, 533 pp., 32 pls. ISBN 0-81852-91-9. $49.95.

The writing of textbooks and surveys is one of the most difficult and thankless scholarly tasks. It requires the author to simplify complex issues and choose sides in innumerable academic controversies. Inevitably the toes of many a specialist will be trod upon. In this respect Kenneth Harl's *Coinage in the Roman Economy*, which attempts to provide "a history of the currency of the Roman world"

(p. 1) over the course of a millennium, should prove no exception. However, while numismatists and economic historians may take exception to some of Harl's arguments and opinions, students and non-specialists alike will no doubt consult it profitably, as a reference work and introduction to the field of Roman monetary history, for many years to come.

In the first chapter, "Coins, the Money of the Roman Economy," the author sets out his general views and methodology. Harl belongs to the modernist camp in the on-going debate over the relative sophistication of the ancient economy. While granting that agriculture was the basis of wealth in antiquity, Harl insists that "Rome approached the economic diversity of late medieval and early modern Europe" (p. 4). Furthermore he rejects the views of those who would strip coinage of its economic significance by reducing it to no more than the role of state fiscal instrument or the means of gift exchange within an embedded economy. Harl goes on to consider the ways in which types of numismatic evidence (die studies, die output estimates, the study of hoards as well as spectral and metrological analysis) can provide information about the ancient economy. Harl is cautiously optimistic on the controversial issue of estimating coin production from die counts (see T. V. Buttrey, "Calculating Ancient Coin Production: Facts and Fantasies," *NC* 153 [1993], pp. 335-51; "Calculating Ancient Coin Production II: Why it Cannot be Done," *NC* 154 [1994], pp. 341-52; and F. de Callataÿ, "Calculating Ancient Coin Production: Seeking a Balance," *NC* 155 [1995], pp. 289-311). He estimates that a die might produce about 40,000 coins on average (p. 10) but concedes that output figures based on this methodology can provide little more than an order of magnitude (p. 15). Harl is also skeptical of the value of hoards and other coin finds which "distort rather than mirror the image of the money in circulation" (p. 11). Because of the drawbacks of strictly numismatic approaches to Roman economic problems the author emphasizes the importance of employing supplementary documentary evidence whenever possible.

The following seven chapters (2-8) lay out the history of Roman coinage from the beginnings of monetization in the fifth century B.C. all the way through to the "loss of Roman monetary ways" following the collapse of the western half of the Roman empire (A.D. 400-700).

Harl describes in great detail the various coins minted by the Roman government, their denominations and changes in weight and fineness. In addition, the author considers the evidence for state revenue and expenditure, the sources of Roman bullion, estimates of coin output, and the usage and spread of Roman coinage as well as other economic phenomena. Local and provincial coinage, not just the issues of the central government, exercise the author's attention. Indeed chapter 5 is devoted entirely to the "currencies of the Roman east." All this can make for rather dense reading but, by relegating the discussion of secondary sources to the notes, Harl succeeds in producing a text which is far more readable than one might expect. The drawback to this method is that *Coinage in the Roman Economy* tends to suffer from a lack of argumentation which even Harl's copious end notes cannot alleviate. The text presents Harl's position but his notes often fail to explain adequately the opinions of other scholars and why his views diverge from theirs.

The story of the rise and fall of Rome's monetary system has been told before (see especially A. M. Burnett's *Coinage in the Roman World* [London, 1987]) but not with this level of chronological, geographical, and bibliographic detail. In broad outline Harl's account differs little from those which have come before: Roman currency and monetary habits expanded in the wake of Roman conquests which provided the bullion to fuel a massive increase in the money supply. Under the Empire shrinking revenues and growing expenses brought about the disastrous downwards spiral of debasement and inflation. However there are some notable differences in Harl's version which, for example, emphasizes the continuity of the Roman monetary system. Whereas most numismatists refer to Rome's early silver coinage as didrachms, and switch to the word denarius only for those coins minted after ca. 211 B.C., Harl refers to both groups of coins as denarii. He portrays the weight reduction and improved fineness of the new coins (72 to the pound and 96% fine) as part of a gradual shift in the late third and early second century from silver coins minted at 45 to the pound and as low as 91% fine (didrachms on the Campanian standard) to ones of "virtually pure silver" minted at 84 to the pound, the form in which the denarius remained until the early empire (pp. 26-39).

Harl also argues for continuity following the third century imperial crisis where other scholars have seen signs of the breakdown of Rome's financial structure. In *The Decline of the Ancient World* A. H. M. Jones wrote that because of the huge inflation of this period "the state came to rely on requisitions in kind to meet its principal needs, and to pay the army and the civil service largely in kind, food, uniforms, horses and arms" (p. 154). Harl categorically rejects this idea of "the abandonment of Roman monetary habits and reversion to a 'natural economy'" (p. 179), asserting that "emperors had always exacted their needs in a mix of kind and coin" (p. 180). Rather, Harl argues, instead of moving away from a reliance on coins, the Roman emperors, Diocletian in particular, sought to create a stable, empire-wide billon currency modeled on the success of Egypt's closed monetary system (pp. 156-57). Egypt was, for the emperor, "a laboratory where he could experiment freely in manipulating and debasing coinage" (p. 124). In Harl's view, the "loss of Roman monetary ways" occurred much later, in the west, "during the fifth century with the collapse of the municipal institutions and regional trade, and to the cities of the Mediterranean heartland during the crisis of the late sixth- and seventh centuries" (p. 269).

Another important aspect of Harl's treatment of Roman monetary history is his faith in the economic sophistication of both rulers and masses in antiquity. For example, he credits sixth- and fifth-century Italiots with seeking to "discourage export of their silver money" (p. 22) by minting on the Achaean or Campanian weight standard rather than the heavier Attic standard favored in long distance trade. Similarly, it is the "genius of Augustus" which creates the system of "interlocking imperial, provincial, and civic coinages of the Principate" (p. 72). However, Harl's statement that Augustus "ingeniously fashioned a token bronze currency in the East. . . by turning the task over to the cities" (p. 108) seems to contradict his assertion that "eastern cities. . . ensured adequate supplies of bronze currency without any central direction" (p. 109).

Harl occasionally seems to mistake results for intentions and, in this regard, the problem of small change in the late Republic is particularly troubling. He implies (the language is somewhat ambiguous) that Caesarian moneyers had a deliberate policy to deal with the short-

age of small change (p. 56). By contrast, Michael Crawford has described the idea "that the Roman state took thought for the supply of small change to its subjects" as "more paradoxical the more I consider it" (M. H. Crawford "Unofficial Imitations and Small Change under the Roman Republic," *AIIN* 29 [1982], p. 141). Though Roman mints did resume production of fractional coinage after a long intermission in the forties B.C., we have no evidence for the reasons behind this change in policy. Given the longevity of Roman coinage (especially bronze) in circulation, our uncertainty concerning coin production levels (again especially for bronze coinage) and our poor understanding of the nature of the demand for small change in general, it has yet to be established satisfactorily that there even was a shortage of small change in the late Republic. If there was a shortage, why did so few cities mint their own bronze coinage as Paestum and Velia did? Harl states that the "cities of Italy and Sicily. . . did not relieve local shortages, because they had, in adopting Roman coins, weights, and measures, ceased striking their own municipal bronze coins" (p. 54) but this is hardly an adequate explanation.

The final four chapters of *CRE* cover a variety of special economic subjects spanning the entire course of Roman monetary history. Chapters 9 and 10 ("Government's Aims and Needs" and "Coins in the Cities and Markets of the Roman World") consider the ways in which individuals and officials actually used coins. These chapters go a long way towards explaining Harl's approach to the ancient economy and it is here that one often finds the argumentation to back up unsupported statements from previous chapters.

"Government's Aims and Needs" deals mainly with the issue of state revenue and expenditure, "how the Roman state minted, used, and put into general circulation hundreds of millions of coins" (p. 207). Harl attempts to gauge the extent of Roman coin production by estimating military expenditure and insists that "the Romans recognized, and reacted to, some reasons behind fluctuations in the money supply and exchange rates even if they did not articulate a monetary policy" (p. 209). A discussion of taxation follows. The author draws interesting parallels to accounts of tax collection under the Ottoman empire in order to stress the brutality, corruption, and other difficulties involved in such activities. Here as elsewhere Harl emphasizes the

long term continuity of Roman fiscal practices, arguing that "the Roman state, even in decline, never relented in its demand for huge numbers of coins" (p. 230) and noting "how little the use of coins in taxation changed under the Dominate and early Byzantine age" (p. 248). The author sums up his analysis in this chapter with five useful diagrams modeling the circulation of Roman coinage on both local and regional levels in ca. A.D. 100.

In chapter 10, Harl switches from public to private coin use but continues to argue for the ubiquity of coinage in Roman daily life, especially in rural areas. This is the author's most sustained attack against the primitivist model of "a rural, underdeveloped economy. . . [in which] coins were chronically in short supply and. . . most transactions were conducted by barter" (p. 251). Harl enumerates the ways in which both poor and rural inhabitants could obtain coinage through the sale of produce, handouts at festivals, as well as wages earned on building projects. Furthermore, he uses estimates of average tax burden and money supply in various eastern provinces to suggest just how much coinage may have circulated in rural areas. These arguments are more effective than those drawn from literary sources (e.g. the ancient novels) since such works may only reflect the experiences of the urban elite. While Harl impressively piles up examples of large cash disbursements, he neglects the issue of the culture of self-sufficiency which may have greatly limited the use of coins among the rural population. As M. I. Finley noted, "there were only a few things a peasant could not produce himself" (*Ancient Economy*[2] [1985], p. 107). John Chrysostom may well claim, as Harl emphasizes, that "we do it all through coins" (p. 254), but Dio Chrysostom's Euboean hunters at least had no need for them.

The penultimate chapter, "Coins, Prices, and Wages," deals primarily with inflation. Harl does a good job of illustrating the difficulties involved in studying inflation in antiquity by showing how widely prices could fluctuate seasonally as well as regionally. Due to the concentration of specie, prices were higher at Rome and the major provincial cities which were "ringed by a succession of concentric circles of progressively lower prices" (p. 275). Arguing chiefly from evidence about military salaries and grain prices, the author suggests that "prices might have risen by less than two times from 46 B.C. to

A.D. 195, but then increased 50 percent in the following two decades"
(p. 274). For other periods, where the evidence is more problematic,
Harl is suitably cautious. Essentially he believes that two periods of
relative stability (200 B.C. to A.D. 235 and 500-615) flank a 250 year
period of "debasement, abortive reform, and inflation" (pp. 288-89).

The twelfth and final chapter investigates the role of "Roman Coins
beyond the Imperial Frontiers." Harl is primarily concerned with the
question of how much coinage left the empire through trade with
northern Europe and the east or through subsidies to barbarians. The
author believes that the purchase of eastern luxury goods did not
cause a significant drain of coinage from the empire since there was a
reciprocal trade in Mediterranean products. "The most serious drain of
specie," Harl believes, "came from tribute, subsidies, and diplomatic
payments rendered to barbarian invaders and Sassanid shahs" (p. 309)
but they also returned much of this coinage to the empire by means of
trade with Roman merchants (p. 311).

In addition to the main text, Harl provides an appendix concerning
Roman weights and measures; 32 excellent plates with photos of
nearly 300 coins drawn mostly from the collection of the American
Numismatic Society; extensive, if unevenly proofread, notes; a brief
glossary of numismatic terms; and an impressive topical bibliography.

It is difficult, in the space of a review such as this, to adequately
evaluate a book of *CRE*'s scope. Harl has succeeded admirably in his
attempt to synthesize the results of various numismatic and archaeolog-
ical inquiries and to "write an account of the salient features in the
evolution and use of Roman currency" (p. 20) for the non-specialist.
The work is also a refreshing counterblast to the primitivism of
Finley's *The Ancient Economy*, but Harl's modernizing tendencies
have taken him too far in the opposite direction. One is tempted at
times to dub this work *Coinage* is *the Roman Economy*. The author
makes the assumption, in my opinion unwarranted, that, by the
beginning of the first century A.D., a third of the population of Italy
was engaged in "innumerable small purchases for daily wants" (p. 48)
and that coinage dominated over other media of exchange (p. 207).
Sadly we hear little about these other media or about the two thirds
of the population who did not use coinage for small daily transactions.
In addition, *CRE* has unfortunately emerged at a time when scholars

have begun to cast serious doubt on some important sources of economic data. T. V. Buttrey has attacked the methodological foundations of coin production estimates (see above) while others have revealed flaws in D. R. Walker's metrological analyses (K. Butcher and M. Ponting, "Rome and the East: Production of Roman Provincial Coinage for Caesarea in Cappadocia under Vespasian, A.D. 69-79" *Oxford Journal of Archaeology* 14.1 [March 1995], pp. 63-77). More troubling still is the work of Richard Duncan-Jones and Walter Scheidel, who question whether we may safely trust the numbers provided in ancient texts. Scheidel found that many of the numbers given in ancient literary texts are conventional or stylized and can only be taken as indicating a certain order of magnitude (W. Scheidel, "Finances, Figures and Fiction" *CQ* 46.1 [1996], pp. 222-38, and see also R. Duncan-Jones, *Money and Government in the Roman Empire* [Cambridge, 1995], pp. 16-19). Nevertheless, in spite of these drawbacks, Harl has made an important contribution to the study of the ancient economy and *CRE* is essential reading for all who are interested in Roman monetary history.

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P. Bastien, *Le buste monétaire des empereurs romains*. Numismatique Romaine 19. 3 vols. Wetteren, 1992-94. 332 pp., 436 pp., 226 pls.

This book, long in the making, is the capstone of a distinguished career devoted to the elucidation of imperial coinage. Pierre Bastien has almost singlehandedly written the entire history of the mint of Lugdunum in the imperial period, and along the way taught other numismatists a great deal about thoroughness of method in dealing with a particular coinage or a particular problem. Here he confronts one of the largest and most enigmatic aspects of imperial coinage, the bust of the emperor himself.

That the image of the emperor was itself sacred we can hardly doubt, so explicit and repetitive is the testimony of our literary and legal sources. It has been considered the authority for the legitimacy of Roman coinage, just as the portrait of the monarch has been seen

as the validator of more modern moneys. Though that view has been softened somewhat for the imperial period, the primacy of the bust side is evident through such statements as those of Suetonius, imputing to Augustus the choice of the Capricorn reverse type and to Nero the depiction of himself as Apollo: the man whose bust appeared on the coin was the one who chose the type. Suetonius's interpretation is one with which we can feel comfortable enough, even if we subscribe to other views of the means by which types were chosen.

It is clear enough that in speaking as he does Suetonius makes explicit what numismatists take to be implicit: that the two faces of a coin are to be understood in the context of one another. This is made most literal when the reverse of a coin contains a finite sentence, as **PACE P**(opulo) **R**(omano) **TERRA MARIQUE PARTA IANVM CLVSIT**: in these cases the imperial *nomen* on the obverse can fairly be regarded as the subject of the sentence. But in this case—as in the others quoted—the bust of the emperor bears no obvious relation to the message of the coin. For example, even when the reverse itself is military in character, it is only adventitious that the emperor is portrayed on the obverse in martial garb. Sometimes he is utterly unclad, and more often he wears regalia that are so banal as to be almost transparent—the oak wreath or, more commonly, the laurel or radiate crown. In the case of the latter, its semantic significance is dubious, since it was gradually transformed from an attribute of divinity (or deification) to nothing more than a denomination mark, thus perhaps reinforcing the famous and odious lines of A. H. M. Jones with which the Bastien's preface begins.

For Bastien it is the bust itself and its gradual transformation, even into divine or quasi-divine form, that is of real interest. He observes (p. 13) that it begins bare, and then gradually acquires attributes often imported from coins of the Greek provinces. The accretion of new attributes leads ultimately to the almost baroque busts that characterize the coinage from the reign of Probus through that of Constantine. The reduction of the nummus in 330 coincides with the disappearance of many of the attributes and the more ornamented busts, and after the fall of Magnentius there is a stark uniformity, the bust diademed and wearing paludamentum and cuirass characterizing the obverses to the fall of the western empire.

The objective of the work is stated on p. 14: "nous étudierons chacun des attributs attachés au buste monétaire et nous en proposerons l'explication. Il sera ensuite plus facile d'interpréter le sens des bustes qui en associe plusieurs." Evidence of parallel sources—literary, sculptural, engraved, painted—is adduced. Questions of style and portrait development are, it is said, a subject for another work.

The author's method is straightforward and reflects the skill at classification already in evidence in so many earlier works. Major headings of unequal length are devoted respectively to emperors, empresses, multiple busts, and symbols associated with busts. The first—the emperors—is again subdivided into three parts: the the head alone (divided into subheadings treating the major varieties—the hair and beard, the bare head, "l'extase heroïque," laurel crown, oak crown, etc.) The second deals with the whole bust—bare, with paludamentum, cuirass, consular mantle, and so on. The third (with which vol. 2 begins) devotes 230 pages to the attributes of the bust with raised hand, expanding on a theme treated succinctly in an earlier article.

The detail of the work is staggering. To take but one example, part I, chapter 13 ("Le diadème," pp. 143-66) traces briefly the history of the diadem from Augustus to Constantine, then, in 16 pages, its more variable history from Constantine to the fall of the empire. Those who have worked with the later imperial coinage are familiar with the broad classifications of diadems with pearls, rosettes, pearls and rosettes, and those with or without frontal ornament. Here, we see all of these, as well as a classification of the transformation of the frontal jewel and three pages on the diadem cords and ribbons and their terminations. All these remarks are accompanied by a wealth of documentation, either cited from the literature, illustrated in the plates, or both. For some this will be overkill but, particularly in its consideration of the coinage of the later empire (with which the author is clearly most comfortable), the approach represents an advance over earlier treatments and may ultimately prove to have the unintended side effect of refining our methods of classifying the coins.

The presentation of the numismatic evidence can hardly be faulted, but often the interpretation is more questionable. On the whole Bastien's approach can be characterized as conservative. I take two examples. The radiate crown, as already noted, can have several func-

tions in the imperial coinage at large, most notably as a symbol of divinity and as a mark of denomination. It first appears on a human bust on the coins of Divus Augustus Pater. It also occurs with the living Caligula at Magnesia ad Sipylum. But at Rome the first living emperor to bear it *on the obverse* is Nero in A.D. 63/4. There is a lengthy discussion (pp. 105-10) of the early occurrences, starting off with the Julio-Claudian ones, recounting various interpretations of the significance under Nero: Grant's view that it was meant to recall the deification of Augustus on the fiftieth anniversary of the event; the denominational significance in connection with Nero's dupondii; L'Orange's proposal that it was intended to suggest the assimilation of Nero to Helios. Bastien insists that the radiate crown, in Nero's case, must be considered in light of the almost simultaneous appearance of the aegis as an attribute, and recapitulates the views (but not the arguments) of these and other scholars. He then simply observes that the coinage reform was more than just a matter of metrology, it was an opportunity for the emperor to assert not only his philhellenism but his "nature supra-terrestre" (p. 107). Now this may well be, but it is very far from being proved. The Caligulan antecedent is simply ignored, apparently on the implicit ground that reverses were different from obverses. Certainly the format was smaller and the design less easy to recognize, but in fact virtually all our ancient testimony is framed in terms of reverse types, and it is difficult to suppose that Caligula's radiate crown was simply overlooked because it appeared on the reverse rather than the obverse.

Again, in his treatment of P. Bruun's hypothesis that the diadem was introduced in 324 (p. 157), Bastien remarks, "rien dans son argumentation ne permet d'étayer solidement cette chronologie. Aussi restons nous fidèles à la date traditionnellement admise" i.e. 325/6. Yet Bruun's arrangement of the coinage—the larger scheme of which is not explored at all here—hardly permits even so slight an alteration, and the somewhat tentative presentation in the text of *RIC* 7 was reinforced already by the time the addenda were printed. Time and time again the "traditional" interpretation is favored, usually at the expense of modern scholars.

Still this is a magnificent achievement, not least because of the plates. No numismatist will now have to resort to the work of

Delbrueck, which will seem painfully inadequate in the face of volume 3, with its 266 plates; and for those who have difficulty translating verbiage regarding hair style into meaning on the coins, there are useful sketches (by Mme. Bastien) of all the major treatments. The bibliography will lead students to a great variety of earlier material, much of which is off the beaten path.

The author has done the discipline a great service by imposing some order on an almost uncontrollable mass of date. His work will provide raw material, and food for thought, for generations of future scholars.

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Ripostiglio di Venèra Nuovo Catalogo Illustrato, Commune di Verona Musei e Gallerie d'Arte. Vol. I, *Gordiano III-Quintillo*, ed. Jean-Baptiste Giard. 139 pp., 18 pls. ISBN 88-7062-872-8. Vol. II/1, *Aureliano*, ed. Sylviane Estiot. 270 pp., 56 pls. ISBN 88-7062-892-2. Rome, "L'Erma" di Brettschneider, 1995.

These two volumes continue the ambitious project of publishing in detail the huge Venèra hoard. The first fascicule (II/2) of the new series, edited by Estiot and treating the coinage of Tacitus and Florian, appeared in 1987 under the imprint of the Museo di Castelvec-chio, and two more (by J. Guillemain on Probus and D. Gricourt on Carus-Diocletian) are in preparation. All are intended to replace the original listing of L. A. Milani (*Il ripostiglio della Venèra* [Rome, 1880]), now nearly unobtainable.

Few hoards of the period are recorded in useable detail, and La Venèra is unique among western ones in having been concealed outside the range of coins of the Gallic Empire. It is impossible yet to assess the hoard in its entirety, but it is obvious that this publication sets a very high standard: the scale of illustration (about 1,700 of nearly 10,900 coins in II/1, substantially lower in the better-documented coinage of I) is grand, and the photographs, taken from casts, are of excellent quality.

Volume 1. As Giard indicates (p. 5), the hoard might as well begin with Valerian and Gallienus, as it has only four coins of the period from Gordian III to Gallus. Is it mere coincidence that three of these

are of the mint of Antioch? The coins of the joint reign offer few
features of interest, and all but 10 of the 131 come from the mint of
Rome.

The picture is somewhat different for the sole reign, from which
come over 5,600 pieces (136-5,776), and here the hoard has evidence
to augment that of the comparably large Cunetio and Normanby
hoards. The one great asset of the lavish presentation is a complete
record of weights (rather than the average weights given in the other
two publications), and thus it is possible to construct frequency curves
and calculate standard deviations type by type or issue by issue. The
evidence of the weights could prove even more valuable for the shorter
reigns of Claudius II (5,777-9,912) and Quintillus (9,983-10,338) (see
below), though it must be said that the tables on pp. 10-11 raise ques-
tions about the value of this criterion. The Normanby hoard offers
comparable numbers of specimens right down the line, but the weights
of the Normanby coins are consistently 10-11% lighter than those of
La Venèra, in spite of what seems to be a somewhat earlier date of
deposit. It is hard to know, and Giard does not guess, whether the
different environments of the deposits or perhaps modern cleaning are
at issue here.

Volume II/1. If specialists find volume 1 useful, volume 2 should be
even more exciting. Here an even larger number of coins comes from
the reign of Aurelian, with numbering beginning again at 1. The text
begins with brief chapters setting the problems presented by Aurelian's
coinage and giving a brief historical account of his reign (pp. 13-19).
Chapter 3 treats circulation on the basis of hoards. In La Venèra the
mints most prominently represented are Milan (30.1%), Siscia (27.9%),
Rome (14.1%), and Ticinum (10.3%), but this simple tally is slightly
misleading, since Ticinum succeeds Milan after the reform and the
figure for the combined entity is thus rather higher. The representa-
tions by mint are almost identical with those in the Maravielle hoard
(published by Estiot herself in "Le trésor de Maravielle (Var)," *TM* 5
[1983], pp. 9-115). The similarity with a hoard from Narbonensis is
explained by the likelihood that the Maravielle hoard was assembled
elsewhere.

Chapter 4 is an analysis, mint by mint, of the coins in the hoard,
beginning with Rome. This mint is fraught with possibilities as well

as problems. A major one is the infamous, "Revolt of the Moneyers," known to us from reports by Aurelius Victor, Eutropius, the *Epitome de Caesaribus*, and the *Historia Augusta*—sources from which, either individually or collectively, only a bold man would attempt to extract history. But it seems clear that the mint actually closed, and probably in this connection, from 271 to 273, after which an improved product emerged.

The reform of the coinage at Rome is placed in the eighth issue, though only the addition of the numerals XXI to the reverse distinguishes reformed currency from that which immediately preceded (pp. 26-27). The final five emissions consist of two in the name of Aurelian alone, two with the emperor and his wife Severina, and a final one in the name of Severina alone. The Alexandrian coinage lends some precision to the date of Severina's first appearance—early 275. This implies that *all* Severina's coinage is to be placed after the reform, and indeed some of it after Aurelian's death. The pattern of issues at Rome is similar to that at Ticinum.

Giard's and Estiot's treatments intersect with the Divus Claudius issues, for the attribution of which unanimity is lacking: Giard (p. 36) gives the relevant recent bibliography. It has long been suspected, mainly on the basis of their size, that issues in the name of the deified Claudius II were not confined to the short period of his reign. More recently it has been suggested that they were part of the first emission of Aurelian (R. Bland and A. Burnett, "Normanby, Lincolnshire," in *The Normanby Hoard and Other Roman Coin Hoards* [*CHRB* 8, London, 1988], pp. 114-215). La Venèra, with its large body of material, supports this conclusion, showing that metrologically the coins of Divus Claudius are much closer to those of Aurelian than to those of Quintillus. Giard accepts the attribution of the Divus Claudius types struck at Cyzicus to Aurelian; the coins of both altar and eagle type from Rome are about 5% lighter than the issues of Quintillus, and here too an attribution to the first issue of Aurelian seems more attractive. From Milan, the rare DIVO CLAVDIO GOTHICO series is represented by only 11 specimens. The mean weight of 6 specimens from officina T, 2.49 g, diverges even more broadly from that of Quintillus's coins from the same workshop (2.95 g, N=15). Estiot notes that the weight is even lighter with respect to the coins of Aurelian (mean

3.55 g, N=33) and that the workshop is underrepresented in the La Venèra, Évreux, and Gloucester hoards in almost identical measure. There is thus little to choose (contra the *Normanby* authors) between the reigns of Quintillus and Aurelian for this issue.

Nor is there any clear reason for the transfer of the mint from Milan to Ticinum in the late spring of 274 (p. 51). The evidence for such a move seems clear enough—the disappearance of any reference to Milan, and the occurrence (from the second issue) of T as a component of the mint mark—but the activity of the mint is something of a puzzle. The representation of its coins in three major hoards—Feldreben II, Gloucester, and La Venèra itself—is inconsistent. It may be that we should not expect homogeneity in hoards that terminate so soon after the issues in question.

This is but one of the mysteries that remain, but the evidence has been laid out clearly for the first time. The publication of this mass of Aurelianic material comes in the wake of Göbl's *MIR*, a highly idiosyncratic presentation of this pivotal coinage which Estiot chose not to cite, as she has dealt with it in a long review article elsewhere ("Aureliana," *RN* 150 [1995], pp. 50-95). It is perhaps as well, since her admirably clear layout of the coinage—synopsized in a table called "La produzione delle zecche e la presenze imperiale" (following p. 138) is likely to stand as the most convenient means of access to this pivotal coinage.

The three fascicules that have appeared to date set a high standard to be followed in future ones and fill a long-standing vacuum in the hoard evidence of the later third century.

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R. H. Ashton, ed., *Studies in Ancient Coinage from Turkey*. Royal Numismatic Society Special Publication 29 = British Institute of Archaeology at Ankara Monograph 17, London, 1996. 160 pp., 69 pls. ISBN 0-90140-533-7, ISSN 0969-0007.

M. Amandry and G. Le Rider, eds., *Trésors et circulation monétaire en Anatolie antique.* Paris: Bibliothèque Nationale de France, 1994. 137 pp., 34 pls. ISBN 2-71771-897-7.

These two volumes are further additions to the welcome flow of new information from Turkey. The ambition of the British volume is to continue the momentum begun by Christopher Lightfoot (in *Recent Turkish Coin Hoards and Other Studies,* reviewed *AJN* 5-6 [1993-94], pp. 248-51) by publishing not only (revised) translations of works that originally appeared in Turkish, but original scholarship as well.

The most substantial single contribution is Roger Bland's study of the bronze coinage of Caesarea under Gordian III (pp. 49-97), which lays out the coinage with the care we have come to expect from him. There is no longer any excuse for relying on the inadequate compilation of Sydenham's *Coinage of Caesarea in Cappadocia.* The volume also includes N. V. Sekunda's interpretation of the early issues of Etenna, explaining their types as a "war sickle" (pp. 9-17). The remainder consists of efforts at recording. Many of the reports are spare in the extreme, but who would not welcome the publication, however brief, of a complete hoard of sigloi, however small (Bayraklı, p. 1) or a similarly detailed listing of a silver hoard including coins of Myndos, Halikarnassos, and Knidos (Göktürk, pp. 5-8)? The pages fill out with hoards representing all periods of antiquity: coins of Tabai and Adramytion (pp. 29-30); Rhodian bronze of the late second century (pp. 41-42); antoniniani through Diocletian (Ihsaniye, pp. 99-103); solidi of the house of Valentinian (pp. 105-6).

Only a few of these hoards are particularly interesting for their contents. A denarius hoard from Manyas is a little unusual for its inclusion of two drachms of Amisus (pp. 31-36), and the Valentinianic hoard mentioned above includes a possibly unique solidus of Valentinian II. In the aggregate the eleven hoards published here epitomize the particular problems of illegal export and theft at home that have plagued the study of the currency of western Asia Minor. The Bayraklı hoard of sigloi and the Çandarlı hoard of New Style silver were found in excavations, but of the others one was seen in the market in London, another in Switzerland; two others were collected and have the usual doubts regarding integrity; and the 210 Æ from the Manyas hoard come from a hoard originally reported at 2,469 pieces. The Kusukkaya hoard report includes 29 coins of 85 thought to have remained in Turkey (the original size was 1,400 pieces).

And so it goes. Depredations of this kind demand this sort of publication. Even the listing of local collections, which might seem indulgent in other contexts, represents a substantial contribution to the total record. Despite continuing efforts in Turkey, the tide is not likely to turn soon against the underground market and, until it does, this kind of publication with its attention to detail and its excellent photography will continue to be welcome.

The same goes for the French volume which, though smaller in scale, is similar in scope to the British/Turkish endeavor. It includes hoards of various completeness, collections, and a survey article by F. de Callataÿ on the Alexander mints of Asia Minor (pp. 19-36) that is in essence a review of Margaret Thompson's work on the drachm mints. Edoardo Levante describes two lots seen in Munich, probably part of the same hoard, which may have been buried near the south coast of Cilicia in ca. 380 B.C. (pp. 7-12). G. Le Rider describes a hoard of diobols on the Persic standard which were purchased from a local resident in 1987 and are now in the museum at Silifke (pp. 13-18). Alain Davesne exploits the evidence of 17 Ptolemaic gold coins found at Aydıncık (pp. 37-43), with a description of what must be a common scene at the accidental discovery of a hoard—an unknown number have simply disappeared, but those that remain are still suggestive for the combination of octodrachms with the bust of Arsinioe II and those with jugate busts of herself and Ptolemy II. The Oylum-Höyüğü hoard, published by Engin Özgen together with Davesne (pp. 45-59) was more fortunate, having been discovered under controlled circumstances and deposited in the museum at Gaziantep. There are also a small hoard mainly of Cappadocian drachms (Kirikhan, pp. 61-64), an apparently complete hoard of denarii and antoniniani through Valerian I from Göktepe (pp. 65-72), and a hoard from Ayvagediği consisting of Cilician Æ, Septimius-Gallienus (pp. 73-118). Finally there is a report on circulation in imperial Pontus, based on the collections of the Tokat museum, that is the first fruit of a Franco-Turrkish collaboration.
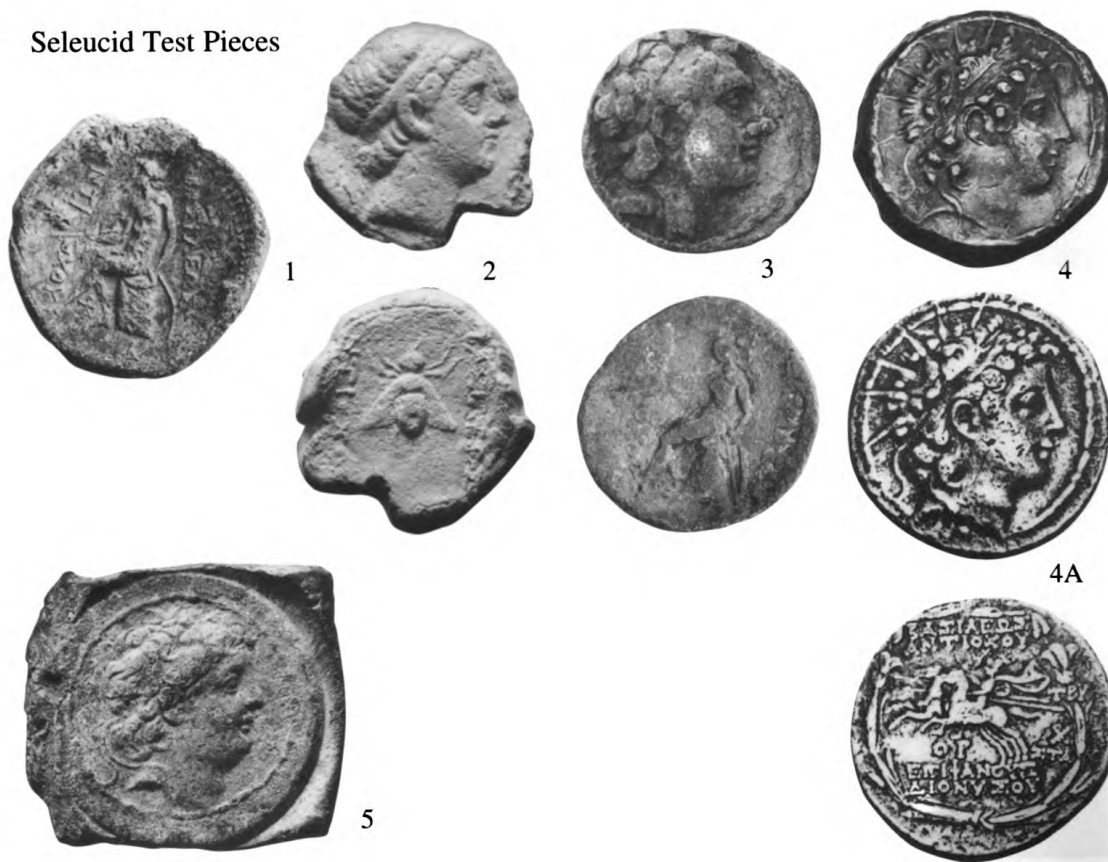
Like the British volume, this one is elegantly presented and rich in illustrations. Both whet the appetite for more of the same. Given the abundance of work by Turkish scholars in both volumes, we can legitimately hope that the wait will not be long.
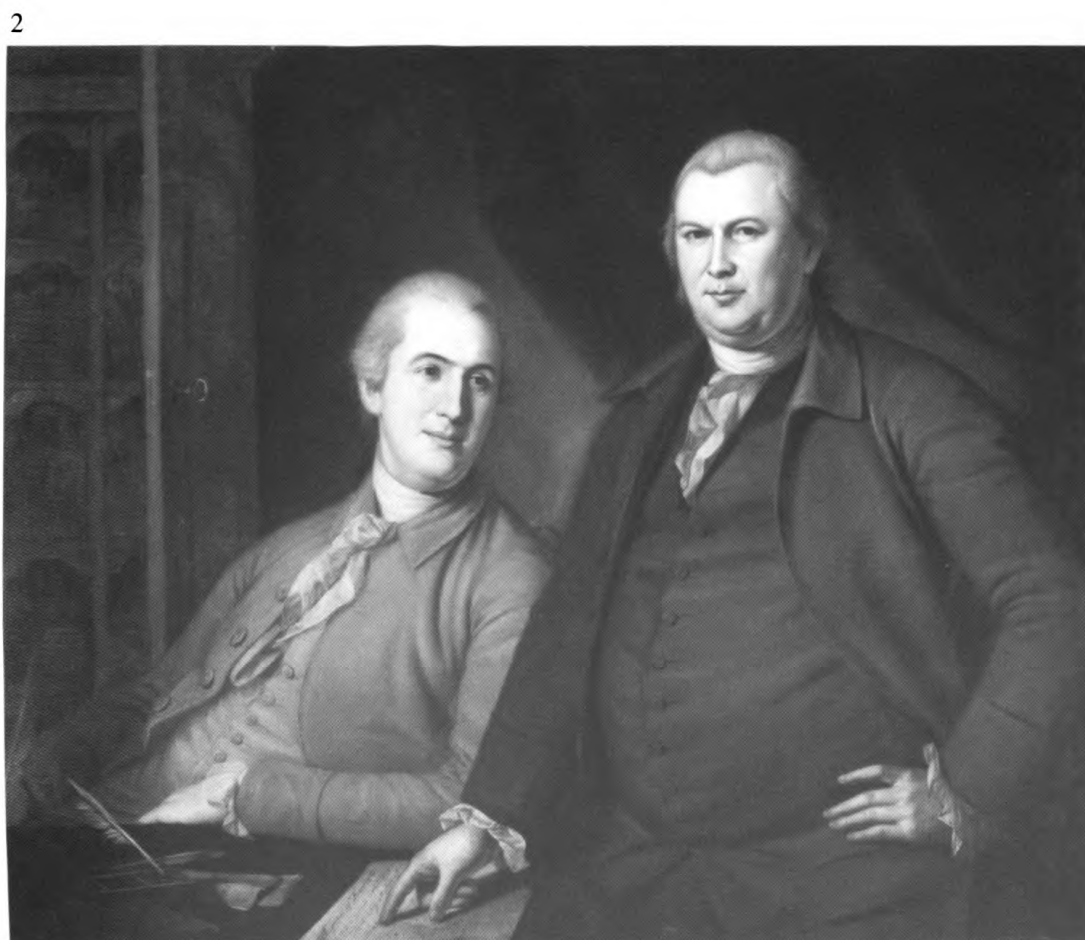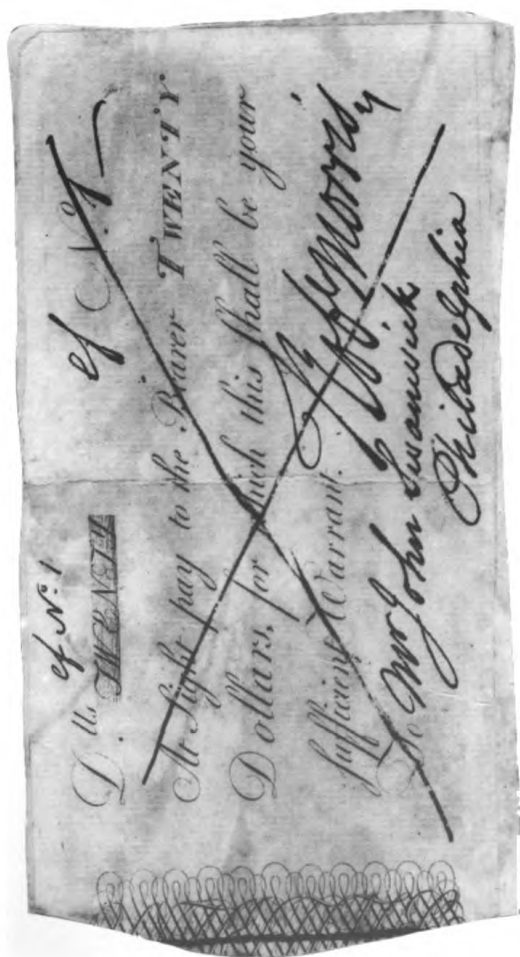
WILLIAM E. METCALF

PLATES

Plate 1

Seleucid Test Pieces

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I/1

II/2

II/3

Xusrō II

Plate 2

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2

The Robert Morris Papers Project

Plate 3

The Robert Morris Papers Project

Plate 4

5

6

The Robert Morris Papers Project

Plate 5

7

No.

No.

Office of Finance, 1783.

SIX Months after the Date, pay, on Account of the United States, to or Bearer,

TWENTY DOLLARS.

Twenty Dollars.

To

No.

No.

Office of Finance, 1783.

SIX Months after the Date, pay, on Account of the UNITED STATES, to or Bearer,

FIFTY DOLLARS.

Fifty Dollars.

To

No.

No.

Office of Finance, 1783.

SIX Months after the Date, pay, on Account of the UNITED STATES, to or Bearer,

ONE HUNDRED DOLLARS.

One Hundred Dollars.

To

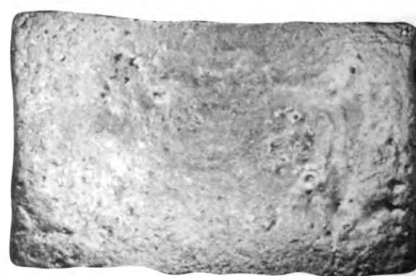The Robert Morris Papers Project

Plate 6
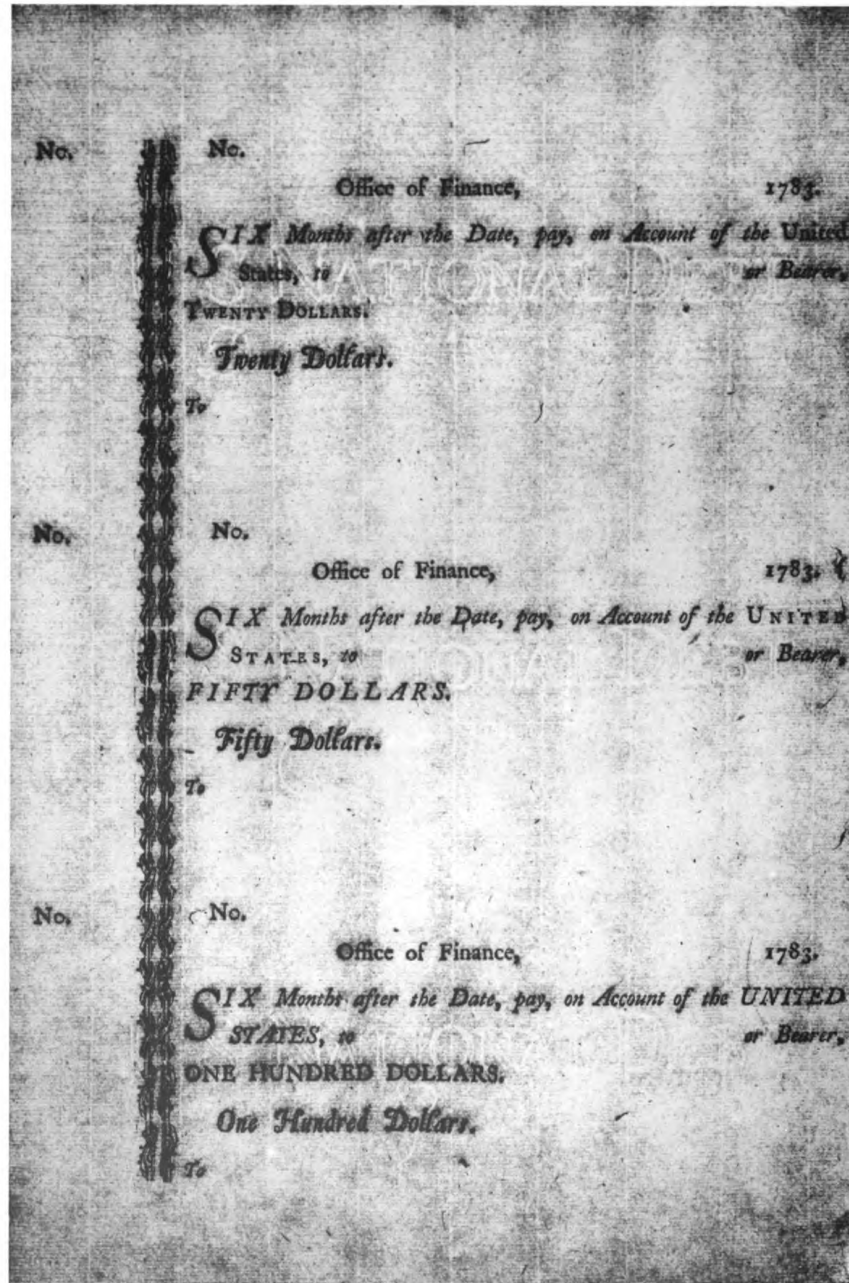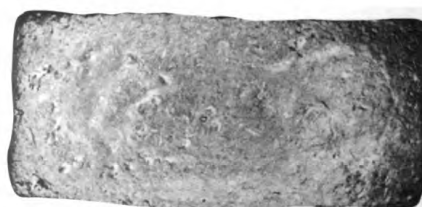

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Typical Smithsonian Western Gold Bars

Plate 7

4

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Typical Smithsonian Western Gold Bars